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Hamilton Noise Survey

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HAMILTON NOISE SURVEY

SUMMER 1972

by

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ABSTRACT

Ambient noise levels in various parts of Hamilton, particularly where there was a interface of residential areas with commercial and industrial zones, was monitored over Thursday through Sunday in the summer of 1972. The data obtained was used to evaluate L_{90} , L_{50} and L_{10} values.

The noise levels were correlated to different types of activity zones. The range of noise level in the city of Hamilton was from 50 to 85 dBA.

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CHAPTER I

INTRODUCTION

The purpose of the study was (1) to provide the Province of Ontario with data on existing noise levels in a city with a high proportion of heavy industry to aid in establishing noise levels in environmental legislations and (2) to provide the City of Hamilton with information on existing noise levels in that city. The study was conducted through a research grant from the Province of Ontario to McMaster University and with aid from the City of Hamilton, pertinent noise level data was gathered at more than thirty locations throughout Hamilton's industrial and commercial zones particularly where these zones interfaced with residential areas. The purpose of this report is to summarize the data which was obtained. Analysis of these data is still in progress and will be covered in subsequent reports.

Measurement locations were selected from a grid system superimposed on a topographical plan of the city. Most measurement locations were separated by one kilometer. In general, grid line intersections served as data source points, however, some locations were selected in between grid points, approximately one half kilometer apart if it was felt that noise level would be of interest at these locations. The measurements were concentrated in those areas of the city which were believed to have the higher noise levels.

Statistical noise sampling was carried out at each of the 30 locations over a period of 24 hours on four different days. Normally an automatic noise recording instrument package was left at a given location from

Thursday to Sunday. It obtained ambient sound pressure levels over about 35 seconds intervals every fifteen minutes. Accumulative noise data of approximately 56 minutes duration was thus obtained for each of the 4 consecutive 24 hour periods. The statistical distribution from this sample was considered adequately representative of the noise occurring during the 24 hour periods. The sampling time is similar to that used in studies being conducted in the City of Toronto, London and Woodstock and will enable comparisons to be made with results from these studies.

There are two main reasons¹ why it is not currently possible to categorize urban noise exposure with a single number or even just a few numbers. The first is the variation in the sensitivity of the human ear with different frequency components and levels of noise. The second and primary reason for the difficulty in describing an urban noise environment in compact terms is the variation of noise with time. Except in rare instances the noise observed at a particular location in an urban community is constantly changing.

INSTRUMENTATION

The commercially available instrumentation package, which was powered by 4 "C" $1\frac{1}{2}$ volt cells, contained a microphone, a Sony tape recorder and a timing system. The timing system and the recorder were housed in a weather-proof steel enclosure measuring 14 inches high by $9\frac{1}{2}$ inches wide by 4 inches deep and the total package weighed 15 pounds. Figure 1.1 gives a diagram of the recording and playback system.

The microphone and the package were mounted on a utility pole about 12-15 feet above ground. The microphone, protected by a wind-screen, was held on a support arm that served to keep it away from the surface of the box thereby reducing the possibility of noise reflection.

The specifications for the tape recorder and microphone system indicated a dynamic range of 45 dBA, from 50 dBA to 95 dBA. However, the units did not meet this specification. An attempt was made to adjust the dynamic range on four of the units which resulted in reliable lower measurement levels of 52, 54, 62 and 62 dBA. The minimum level on one unadjusted unit was determined to be 68 dBA.

The magnetic tape data were used to produce graphs and charts showing the range of noise levels and the proportion of time during which any chosen level was exceeded.

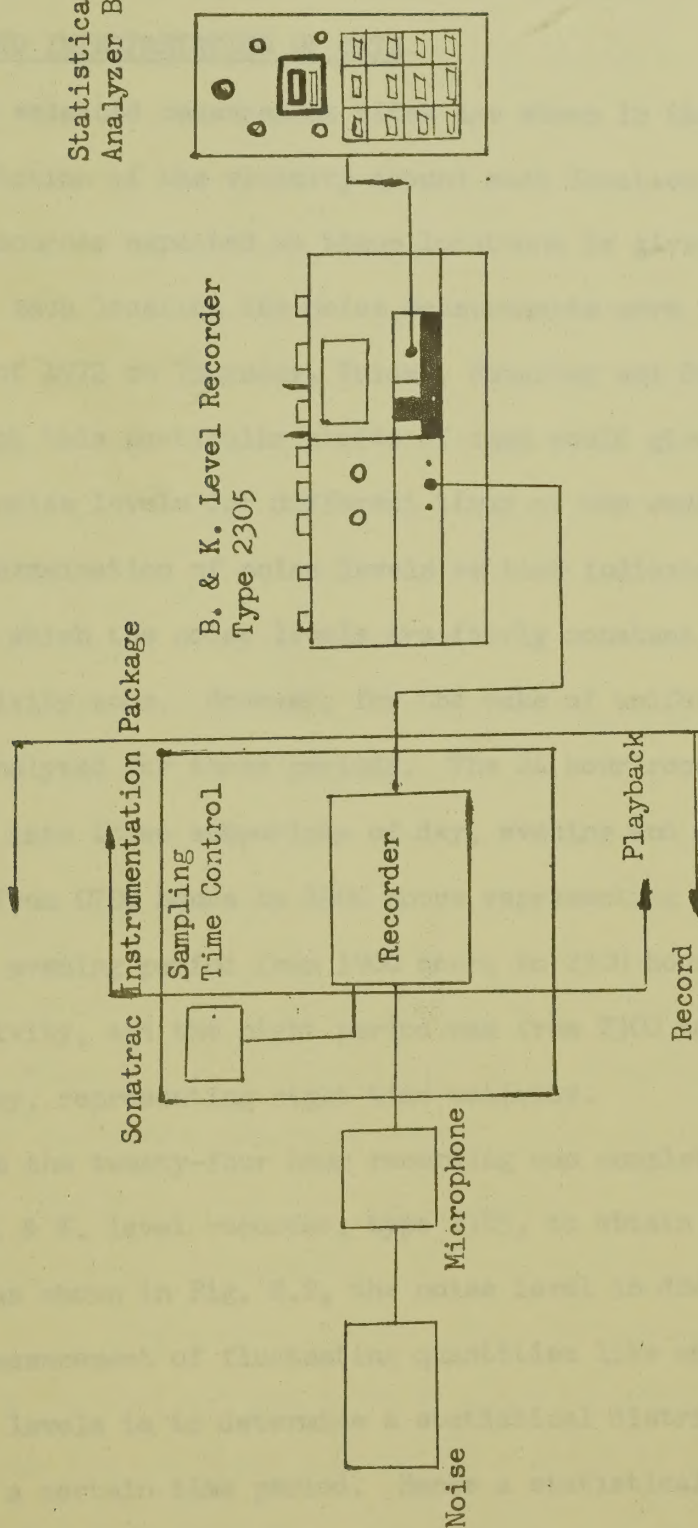


Fig. 1.1 Noise Recording and Playback System

CHAPTER 2

LOCATIONS AND INTERPRETATION OF DATA

The selected measurement sites are shown in the Fig. 2.1. A brief description of the vicinity around each location point and the main noise sources expected at these locations is given in Appendix A.

For each location the noise measurements were carried out during the summer of 1972 on Thursday, Friday, Saturday and Sunday because it was felt that this particular choice of days would give a good indication of varying noise levels for different times of the week.

An examination of noise levels vs time indicates that the time period over which the noise levels are fairly constant, varies for each type of activity zone. However, for the sake of uniformity the measured data were analyzed for three periods. The 24 hour recording period was divided into three subperiods of day, evening and night. The day period was from 0700 hours to 1900 hours representing work day including rush hours, evening period from 1900 hours to 2300 hours, representing evening activity, and the night period was from 2300 hours to 0700 hours following day, representing night time activity.

Once the twenty-four hour recording was completed, it was played back on a B. & K. level recorder, type 2305, to obtain a graphical noise chart such as shown in Fig. 2.2, the noise level in dBA* as a function of time. In measurement of fluctuating quantities like noise, the problem of changing levels is to determine a statistical distribution of noise levels over a certain time period. Hence a statistical Distribution Analyzer, B. & K. type 4420, was simultaneously run with the level recorder to obtain a step-wise noise level distribution.

*see next page.

STATISTICAL ANALYZER

The statistical analyzer had 12 distribution channels and each channel level was separated by 2.5 or 5 dBA depending upon whether a 25 dBA or 50 dBA potentiometer was used in the B. & K. level recorder. The potentiometer used depended on whether the total spread of noise levels was greater or less than 25 dBA.

There were ten counts per second of the tape noise recording. For a given period a count estimate was obtained from the tape length and the timing watch. The statistical analyzer was set to this count number and the tape was played back. When a step-wise noise level fell within a channel level it increased the count number in the channel by one. This allows for the determination of noise levels which are exceeded 90%, 50%, and 10% of the time and designated by the symbols L_{90} , L_{50} and L_{10} respectively. A reasonably reliable description of the urban noise exposure can thus be given by stating various statistical noise levels for a given location over a specified period.

* The simple sound weighted index dBA is in wide use as a simple means of assessing the subjective qualities of annoyance and noisiness. This index is based on a weighting network, which is an electrical circuit that roughly approximates the response of an average human ear to sounds of different frequencies. We hear sounds at some frequencies better than other frequencies of the noise. The A-scale allows the instrument to "respond to" the noise at different frequencies similar to the way that the ear hears it, and as a result is commonly used in environmental noise studies.

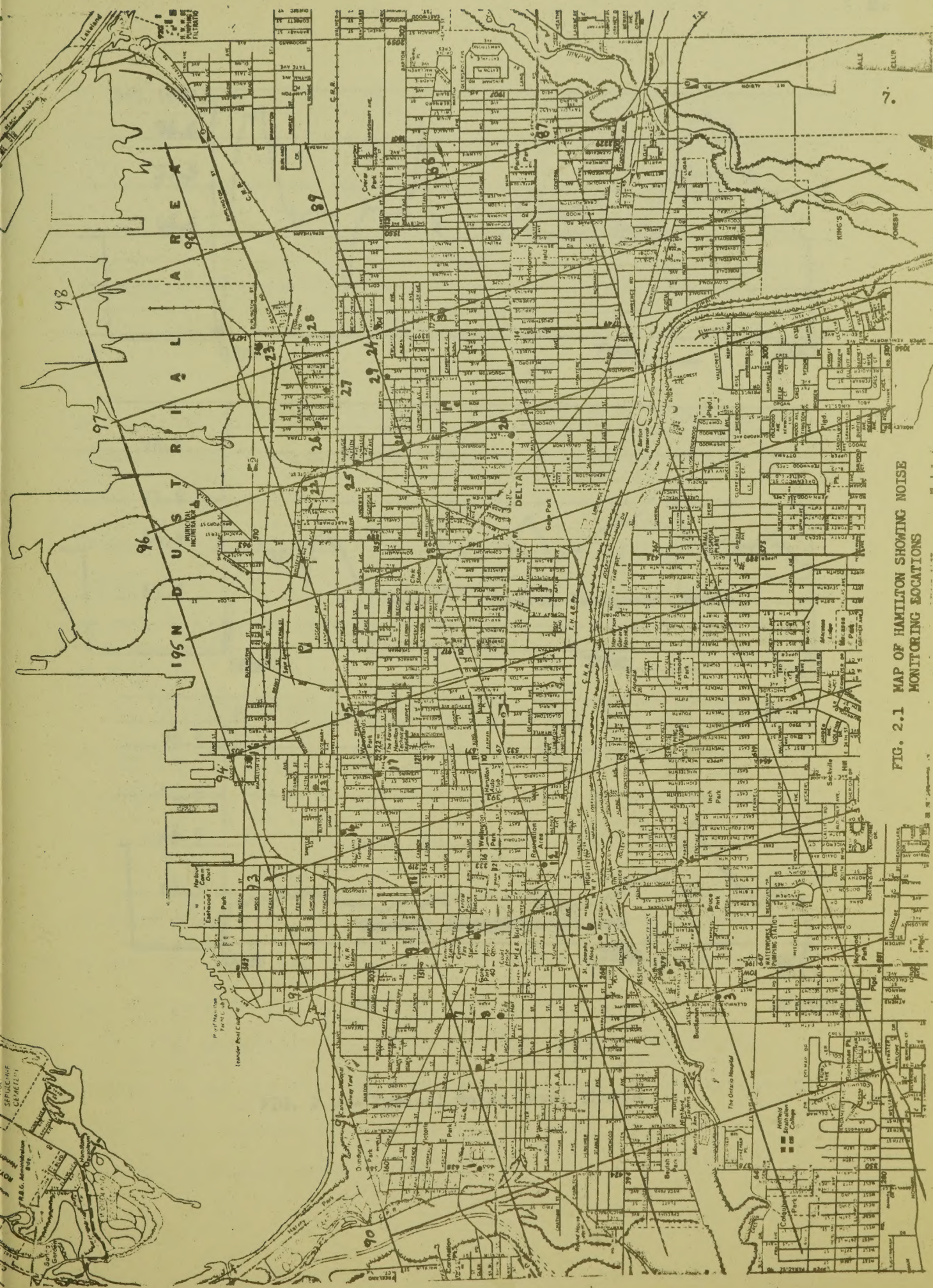


FIG. 2.1 MAP OF HAMILTON SHOWING NOISE MONITORING LOCATIONS

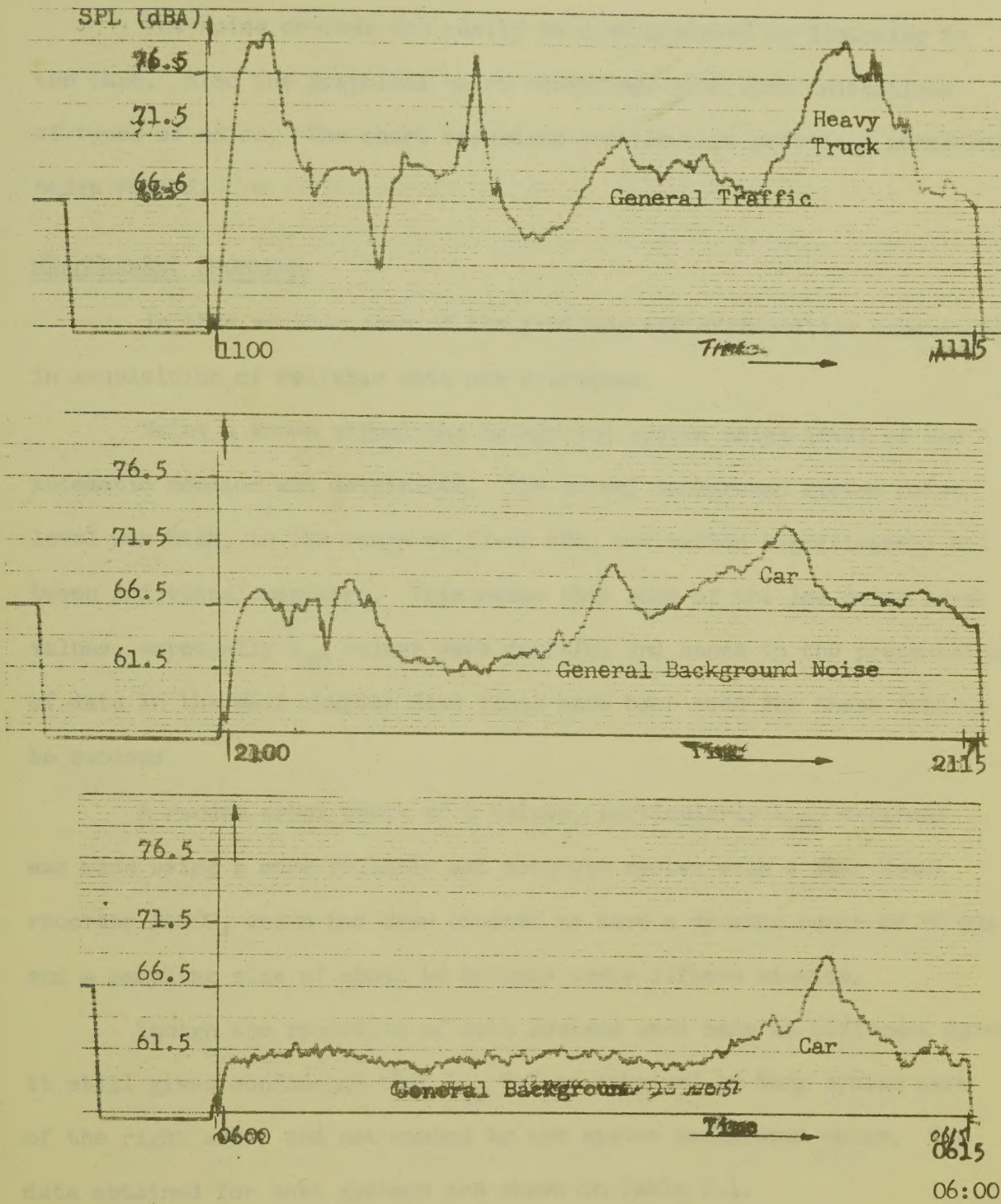


FIG. 2.2 - Typical Noise Level Charts

The noise sources can easily be distinguished by listening to the tape. Also the graphical chart recordings give some indications of types of noise. The chart recording and the tape provide a permanent noise record.

MEASUREMENT PROBLEMS

In this section some of the problems and difficulties encountered in acquisition of reliable data are discussed.

Using a known signal the background system noise level of the automatic monitor was determined. The actual background system noise level was high, in the range of 52-64 dBA, and varied significantly between individual monitors. This means that some of the low noise level values, especially L_{90} values were doubtful and hence in the presentation of data in the next chapter dash lines have been used for those felt to be dubious.

A random cross check of L values, particularly L_{90} , obtained was made using a more reliable and accurate system with a Uher Model recorder #4200, which had been adapted to have a dynamic range of 70 dBA and a sampling size of about 40 seconds every fifteen minutes.

Though the recording of both systems were made on different dates, it still gives confidence that L_{90} values obtained by Sony system were of the right order and not masked by the system background noise. The data obtained for both systems are shown in Table 2.1.

The electrical contacts on the timer which turned the tape recorder on and off worn over a period of time and as a consequence the noise sample recording time was somewhat shortened from 35 seconds to about thirty seconds every fifteen minutes.

Based on the experience with this instrument and the results of other community noise studies it is safe to say that the actual noise levels may be somewhat less than shown by the dashed L_{90} lines but they are not as far below the L_{50} lines as the L_{10} lines are above them.

The measurements carried out on Thursday, Friday, Saturday and Sunday were assumed to be representative of the entire week in summer-time days. In practice this was not so when the days on which sample recordings were taken were (1) preceeded (2) followed or (3) on public holidays. The noise levels obtained were then just a representation for that particular day and date. These particular days are denoted by asterisks in the presentation of the data.

The division of the 24 hour period into 3 subperiods resulted in some overlapping of counts at the interface of the change-over hour. Although this would somewhat alter the sample distribution in a given period the resulting inaccuracy in the L values was found to be small and well within the measurement accuracy.

Data were discarded for one of the following reasons:

1. If the noise levels at the location site were below the background system noise levels of the monitoring unit.
2. If the weather conditions at the time of measurement were such that the validity of the data was in question. High winds, for example, can affect the measurement data. Appendix B gives a report of weather condition on the days of the noise recording.
3. If during the recording an unusual loud humming noise source was present, this was suspected to be due to the microphone, which altered the noise recording level of the site.

TABLE 2.1

LOCATION #	UHER RECORDER			SONY RECORDER		
	L ₉₀	L ₅₀	L ₁₀	L ₉₀	L ₅₀	L ₁₀
2	53.1	57.5	66.2	60.3	67.1	75.2
Queen St. between	51.0	56.5	67.0	62.6	66.3	72.8
King and Main	47.5	51.7	61.0	61.3	61.7	69.4
14	55.0	60.5	69.4	55.9	61.5	71.5
Victoria and	54.5	57.5	65.0	55.6	59.1	66.0
Birch	50.4	58.4	64.5	51.2	55.8	63.3
23	72.0	75.5	81.7	66.4	68.9	75.4
Stapleton and	61.0	66.0	75.5	65.4	67.8	69.3
Burlington St. E.	65.5	68.4	74.0	66.0	68.3	70.8

CHAPTER 3

PRESENTATION OF DATA

This section presents the measured noise level data for all of the site locations shown in Fig. 2.1. For each location the noise level in dBA is shown as a function of the day of the week with L values as a parameter.

When the measured noise level at a given site approached the background system noise level the data points are shown in the following figures by a dash line. In most cases the resulting L_{90} values obtained were in some doubt. (See comment on page 9 for an interpretation of these measurements.) The accuracy of the data obtained was within ± 2 dBA.

In most cases the same instrument package, microphone and tape recorder was used at a particular measurement location. In those cases where the same package was not used over the four day interval the reference noise level of the statistical channel count distribution on the Statistical Analyzer was shifted to give correct interfacing levels for a particular day.

To get some indication of noise levels in different types of zones the thirty locations were categorized into one of five classifications; (1) residential, (2) residential-commercial, (3) commercial downtown; (4) industrial residential; and (5) mountain access routes. Tables 3.1 and 3.2 give some indication of the noise levels in these types of zones.

The lower noise levels indicate the quiet area of each zone and the high noise levels were generally measured in areas in the zone which were adjacent to a zone of greater activity and hence higher noise level. As an example the higher noise levels of the residential area

indicate that it is close to a commercial or industrial interface or a main traffic artery.

LOCATION	TYPE OF DEVELOPMENT	ESTIMATED COST (\$)	ESTIMATED REVENUE (\$)	NET COST (\$)
1. New commercial location 450 sq. ft. 1st fl. building on vacant lot	Commercial building	10,000	2,000	8,000
2. Industrial development 10,000 sq. ft. building on vacant lot	Industrial building	20,000	4,000	16,000
3. Commercial building 10,000 sq. ft. 1st fl. building on vacant lot	Commercial building	15,000	3,000	12,000
4. Industrial development 10,000 sq. ft. 1st fl. building on vacant lot	Industrial building	20,000	4,000	16,000
5. Residential development 10,000 sq. ft. 1st fl. building on vacant lot	Residential building	12,000	2,400	9,600

Costs may be questioned

LOCATION	L ₉₀	L ₅₀	L ₁₀
1. Residential Location #19,24,30,3,18 Daytime Evening Night	51.0*- 56.0 51.5*- 56.6 49.9*- 53.7*	53.0*- 59.0 53.9*- 61.1 52.1*- 56.2	60.3 - 66.4 58.2 - 65.7 53.4*- 61.2
2. Residential Commercial #4,12,20,21,29 Daytime Evening Night	59.1 - 64.1 60.1 - 62.5 58.2 - 64.3	63.6 - 68.5 63.3 - 67.9 61.0 - 67.7	69.5 - 75.0 68.0 - 71.0 63.8 - 72.9
3. Commercial Downtown #7,8,9,10,11,12 Daytime Evening Night	59.0 - 69.0 56.6 - 69.5 56.2 - 68.5	65.2 - 73.5 62.6 - 73.6 58.5 - 72.3	74.5 - 80 70.7 - 79.4 66.3 - 83.4
4. Industrial Residential #1,13,14,15,16, Daytime 22,23,25,26,27, Evening 28 Night	52.7*- 70.2 52.8*- 71.2 50.4*- 73.0	56.7 - 73.2 54.1*- 73.9 52.9*- 74.9	61.4 - 81.6 57.0 - 78.6 54.7*- 81.2
5. Mountain Area #5,6,2 Daytime Evening Night	57.5 - 66.4 58.5 - 68.2 53.3*- 67.5	65.2 - 72.4 64.3 - 72.0 58.0 - 70.7	71.8 - 78.0 69. - 76.4 65.0 - 76.8

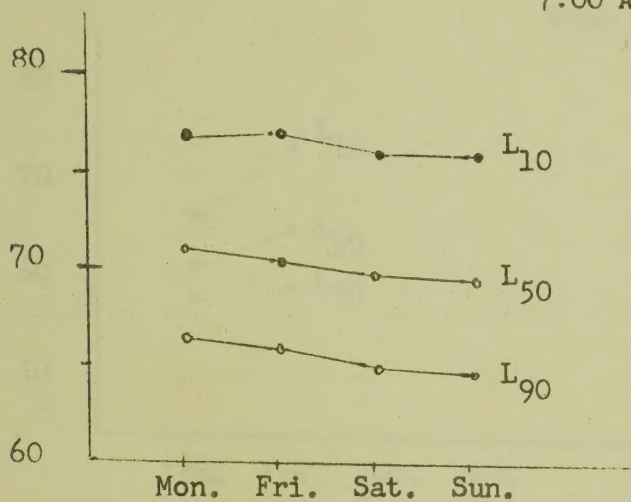
* Levels may be questionable

LOCATION	L ₉₀	L ₅₀	L ₁₀
1. Residential Location #19,24,30,3,18 Daytime Evening Night	48.0* - 52.3* 45.4* - 53.9* 45.3* - 53.7*	47.0* - 58.9 48.1* - 57.5 47.1* - 54.7*	53.4* - 65.8 54.3* - 66.8 52.0* - 57.9
2. Residential Commercial #4,17,20,21,29 Daytime Evening Night	53.5* - 67.3 49.3* - 67.8 47.8* - 69.0	57.0 - 70.4 52.7* - 71.0 49.7* - 72.1	64.5 - 76.5 61.4 - 75.6 56.1 - 77.9
3. Commercial Downtown #7,8,9,10,11,12 Daytime Evening Night	54.8* - 68.3 52.5* - 68.3 51.6* - 67.7	58.4 - 72.3 58.5 - 73.2 64.7 - 77.9	64.4 - 79.3 64.7 - 77.9 64.0 - 78.1
4. Industrial Residential #1,13,14,15,16 Daytime Evening Night	51.3* - 72.9 51.5* - 75.5 49.9* - 80.3	52.4* - 78.5 52.0* - 77.0 51.3* - 86.0	55.9* - 86.9 61.8 - 83.9 53.8* - 90.1
5. Mountain Access Route #5,6,2 Daytime Evening Night	53.5* - 66.2 57.0 - 65.6 51.1* - 67.1	62.3 - 69.9 64.6 - 69.9 55.5* - 69.8	72.3 - 75.9 70.2 - 73.6 67.2 - 75.0

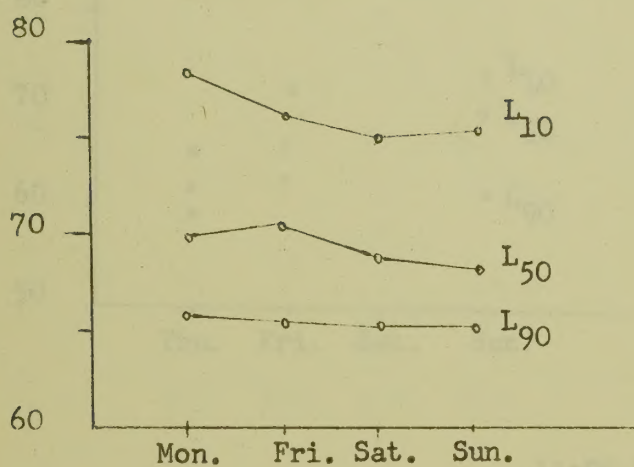
* Levels may be questionable

SPL (dBA)

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

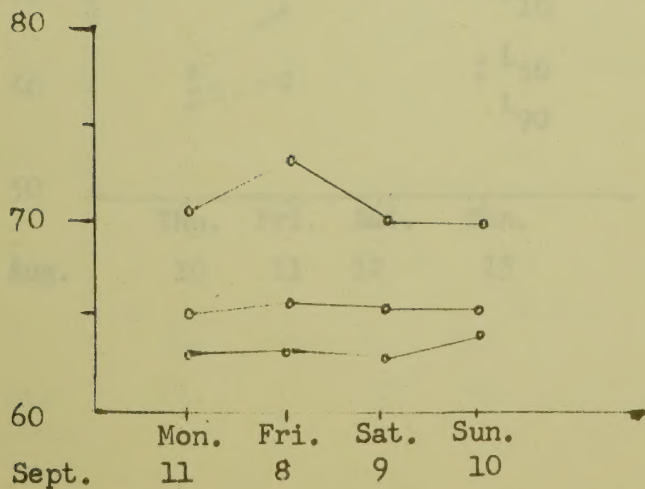


FIGURE 3.1

LOCATION 1 - Dundurn between
King St.W. and Main St.W.

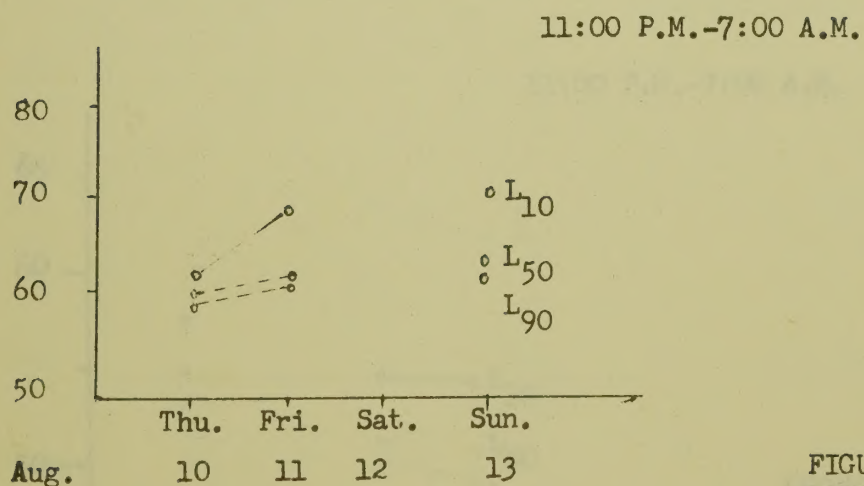
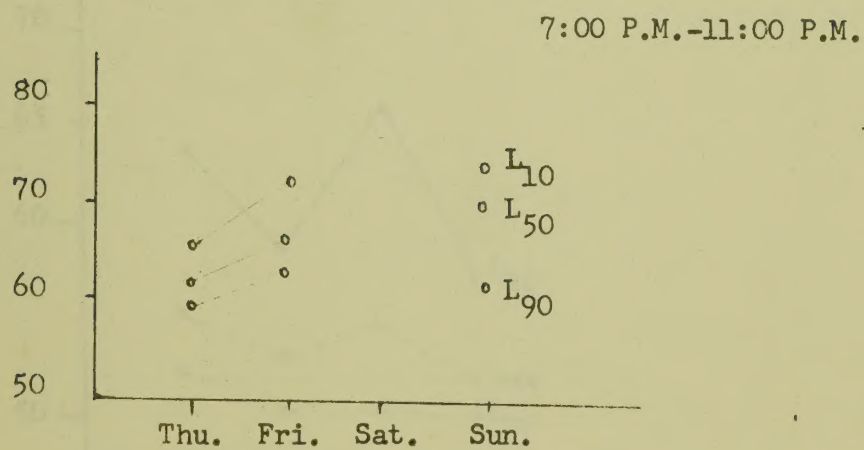
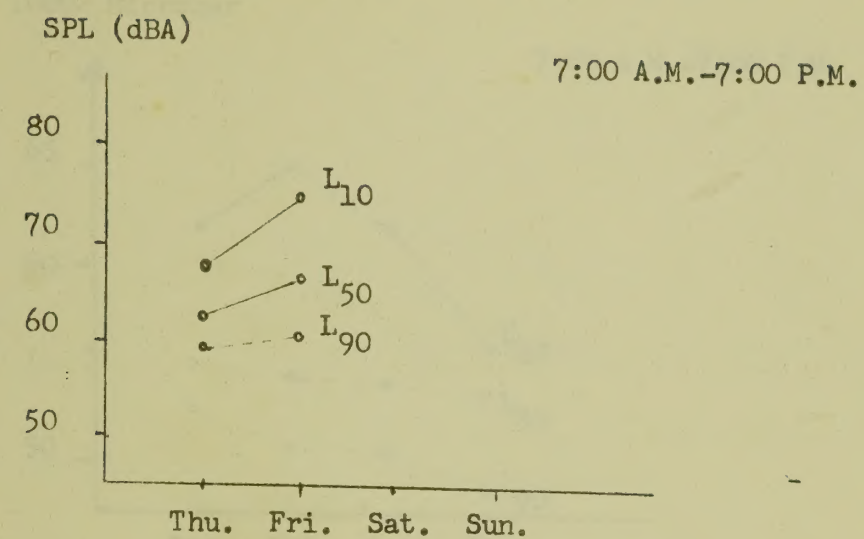
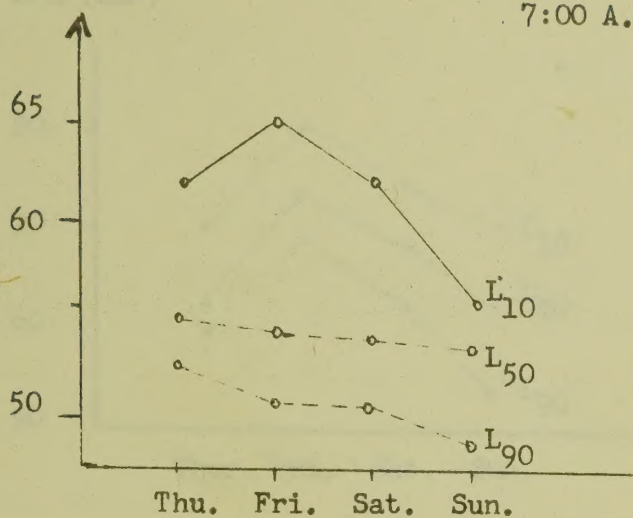


FIGURE 3.2

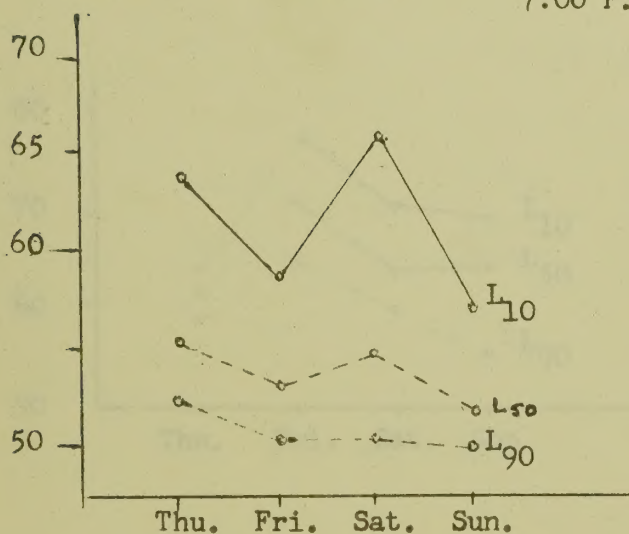
LOCATION 2 - Queen St. between
King St.W. and Main St.W.

SPL
(dBA)
re: .0002 Microbar

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

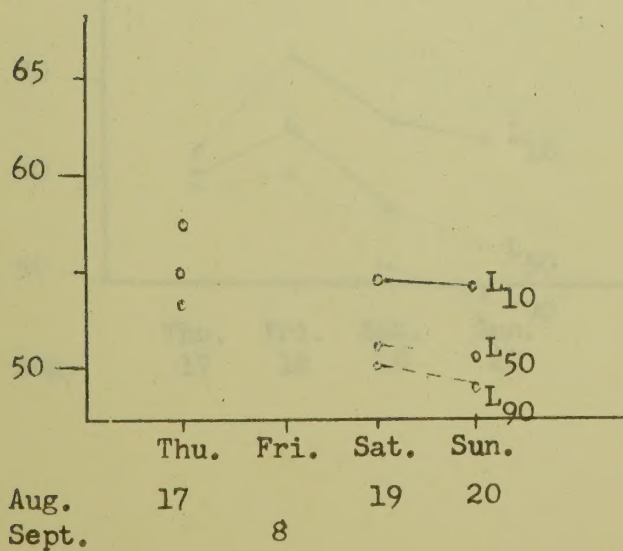
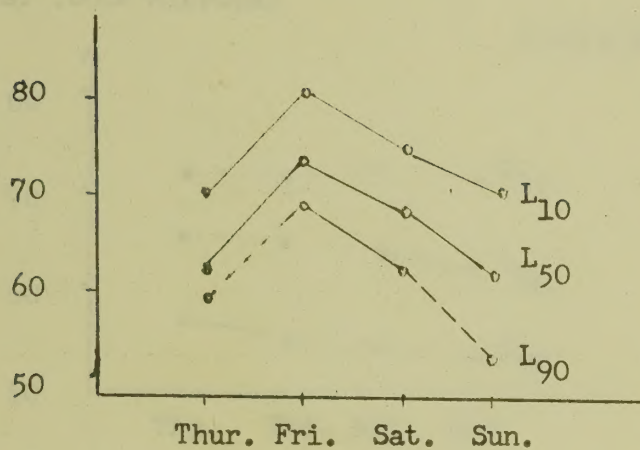


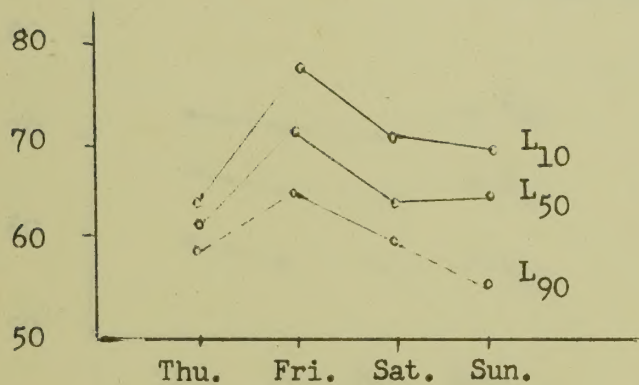
FIGURE 3.3
LOCATION 3 - Brantdale and Glenwood

SPL (dBA)

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7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

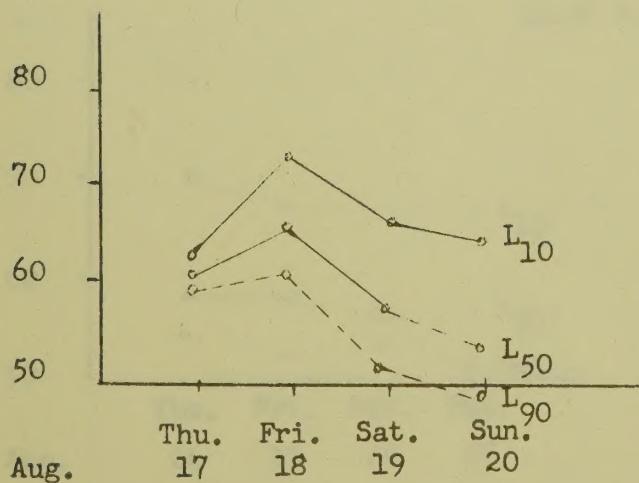
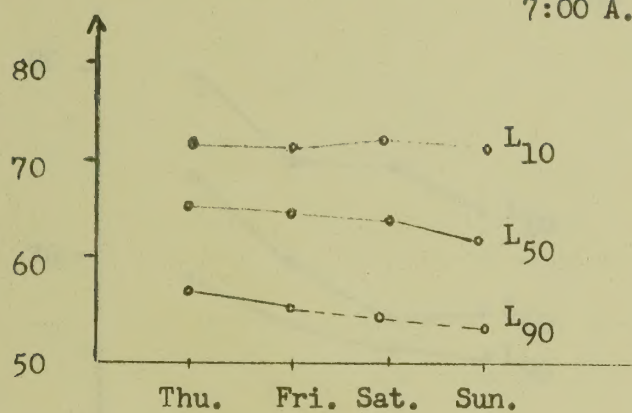


FIGURE 3.4

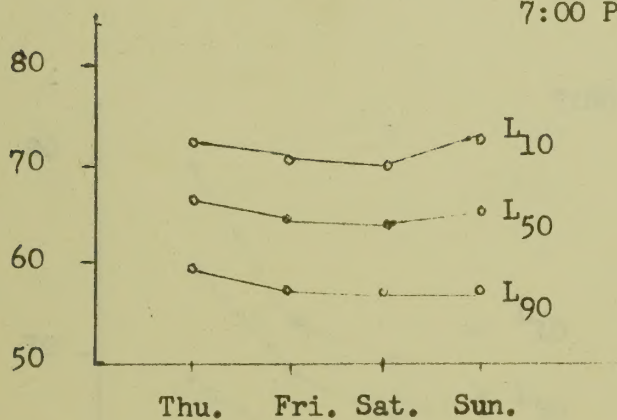
LOCATION 4 - Upper Wellington
and Inverness

SPL
(dBA)
re: .0002 Microbar

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

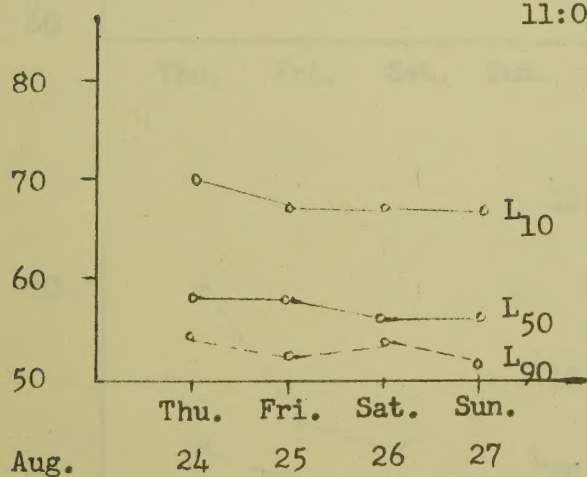
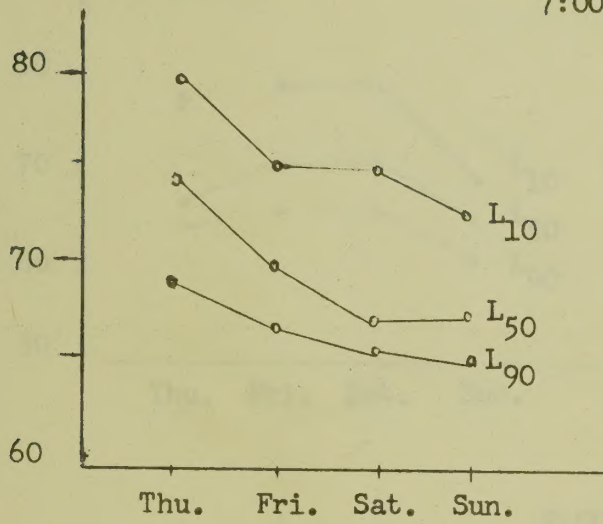


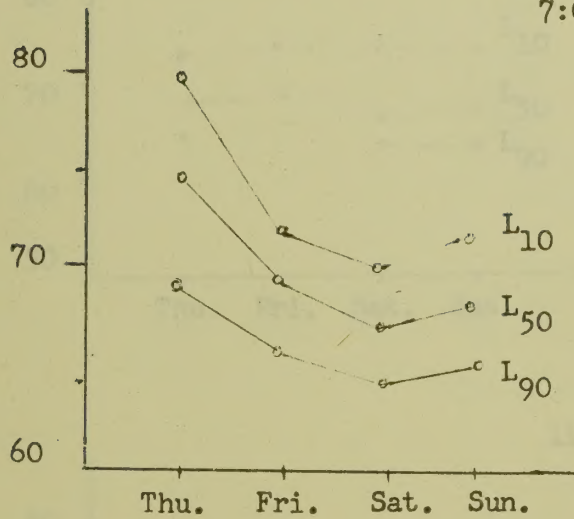
FIGURE 3.5
LOCATION 5 - Upper James and
Rosedene

SPL (dBA)

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

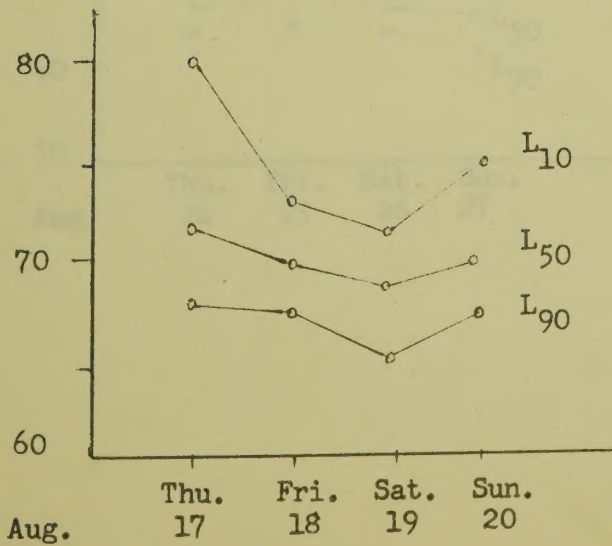
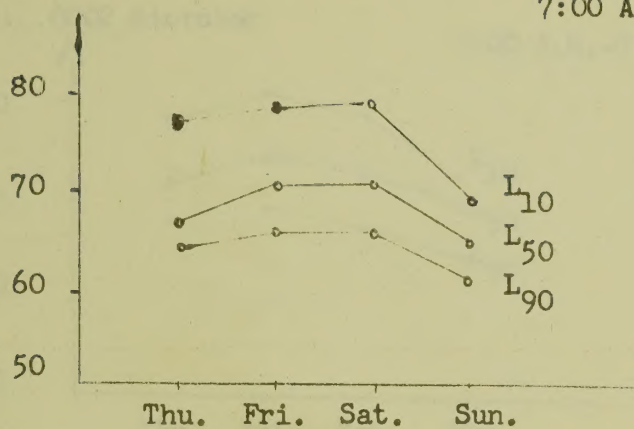


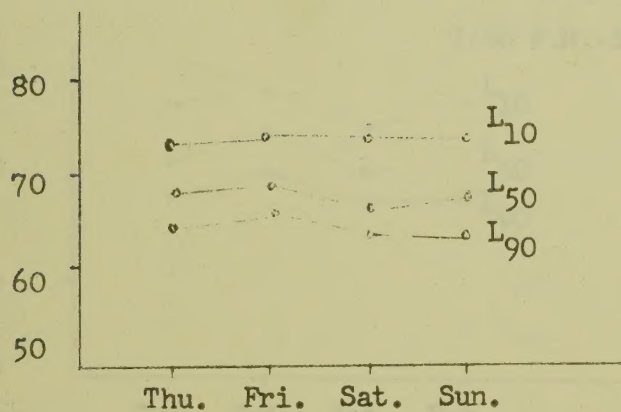
FIGURE 3.6
LOACTION 6 - John St.S. and Arkledun Ave

SPL (dBA)

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

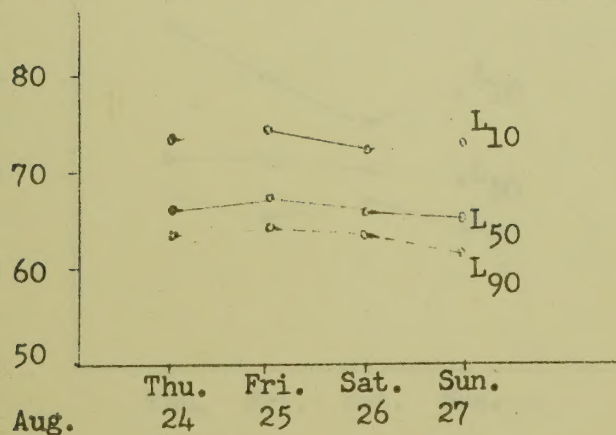


FIGURE 3.7
LOCATION 7 - Bay St.N. and York St.

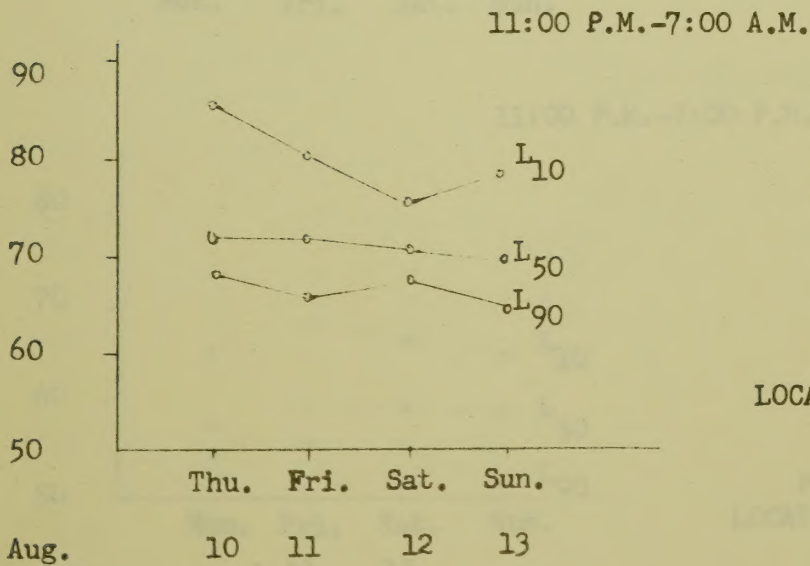
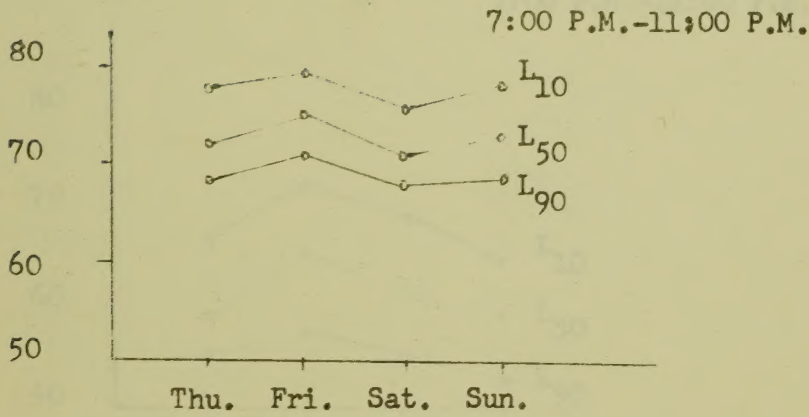
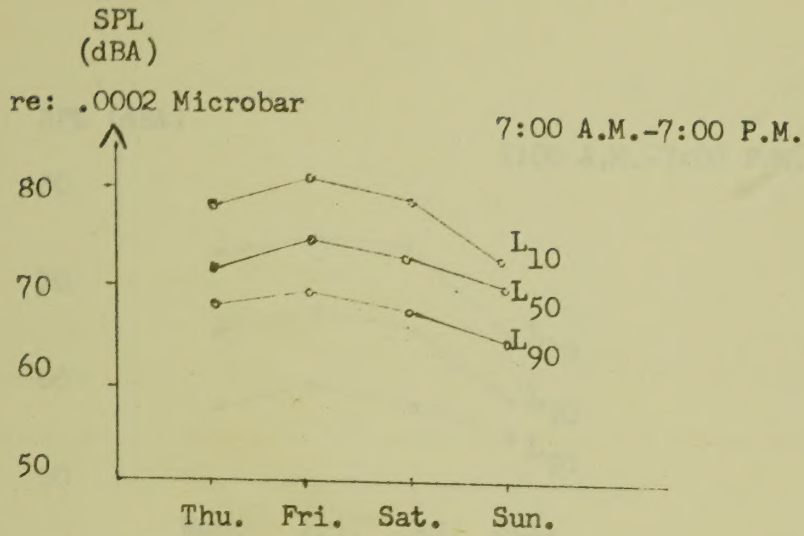


FIGURE 3.8
LOCATION 8 - Bay St. and Main St.

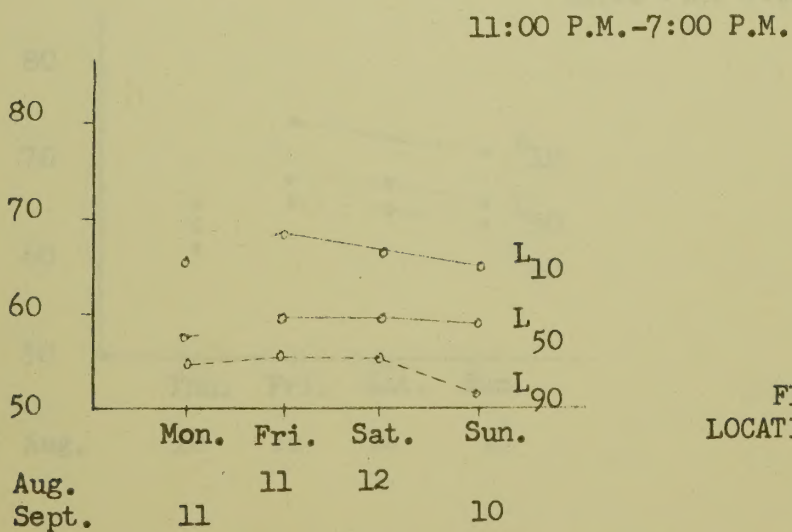
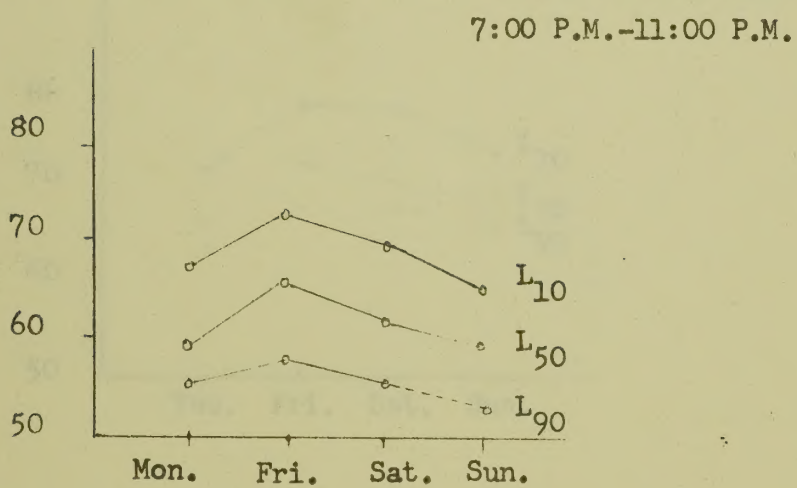
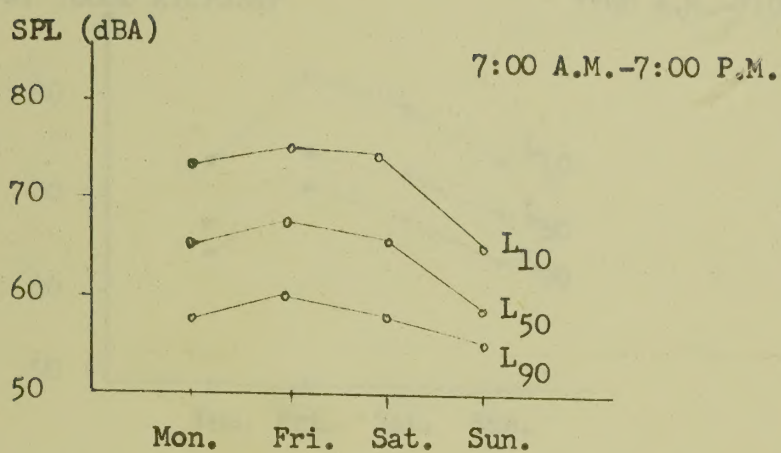
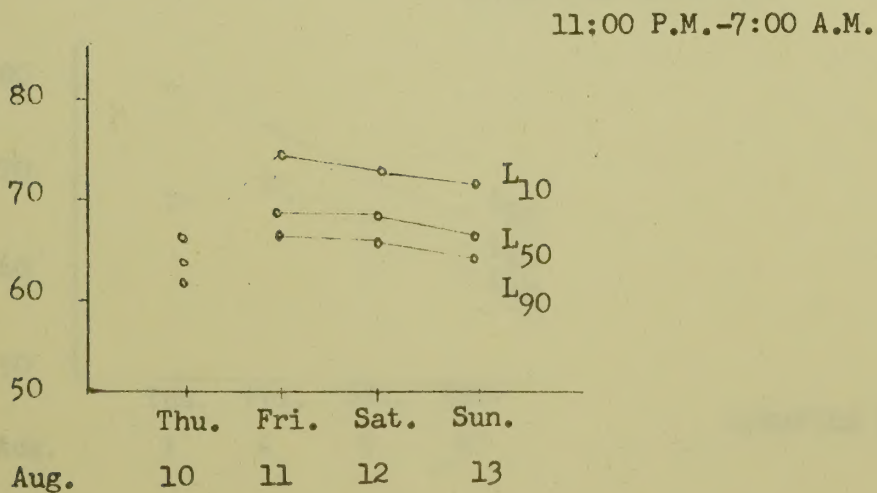
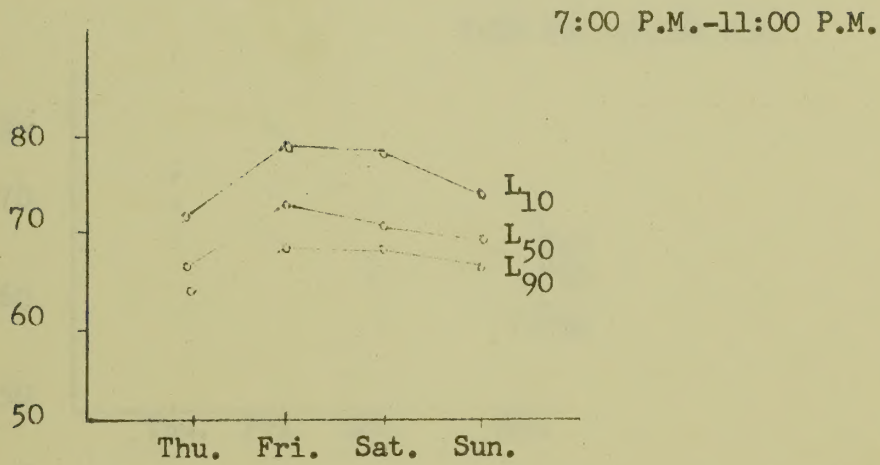
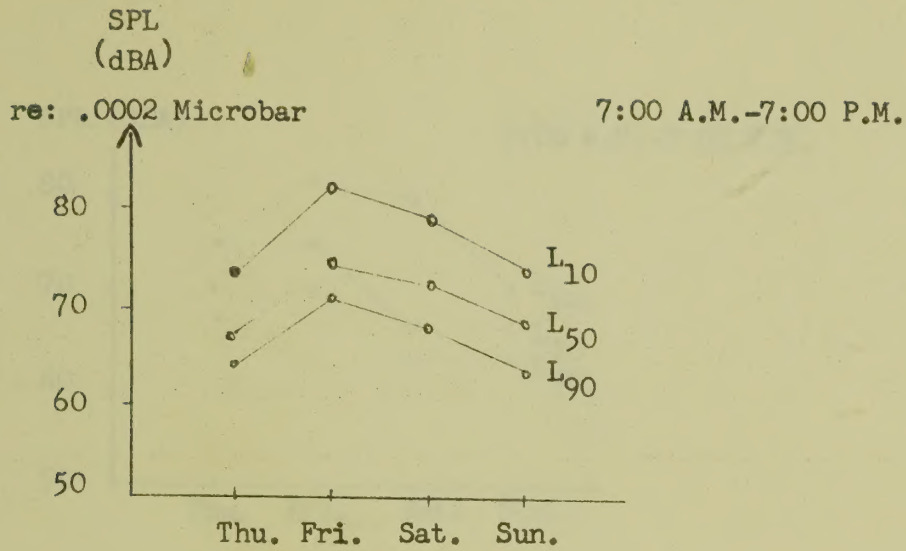


FIGURE 3.9
LOCATION 9 - Hughson and Wilson



LOCATION 10 - John St. N. and King St. W.

FIGURE 3.10

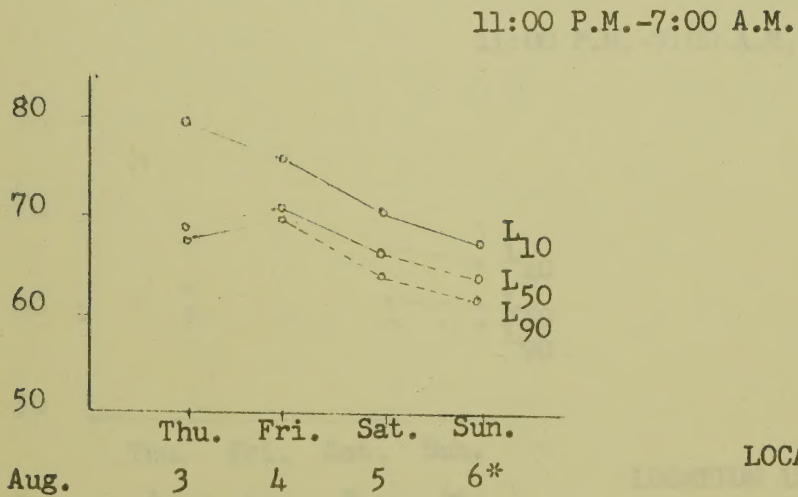
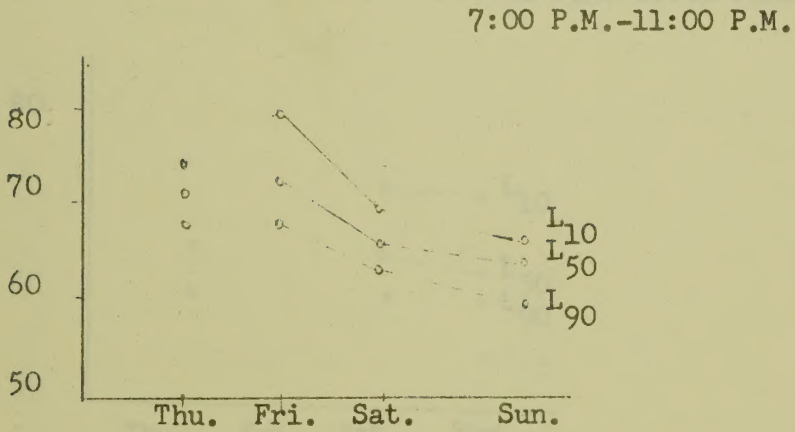
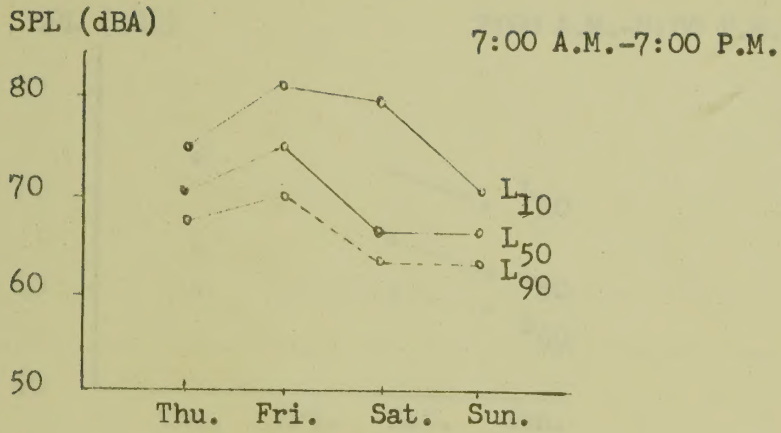


FIGURE 3.11
LOCATION 11 - Cannon and Ferguson

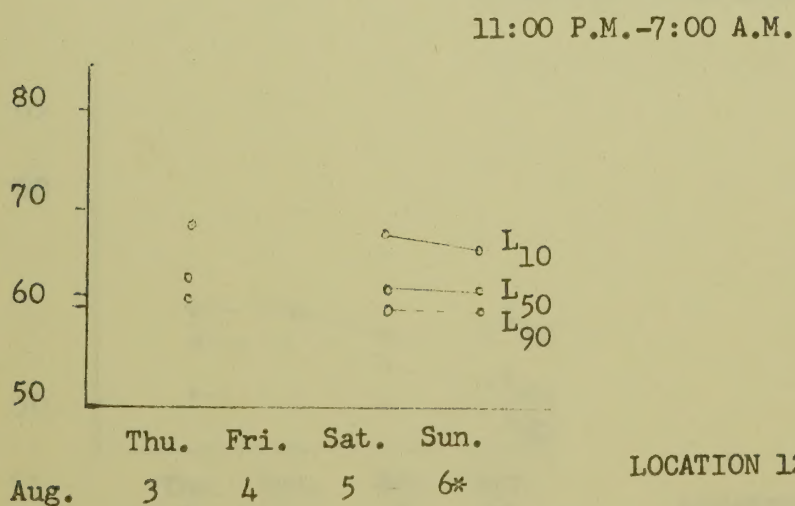
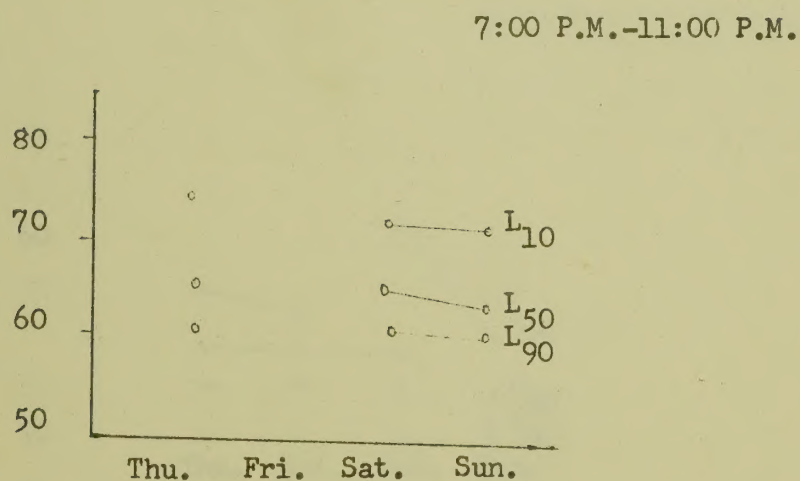
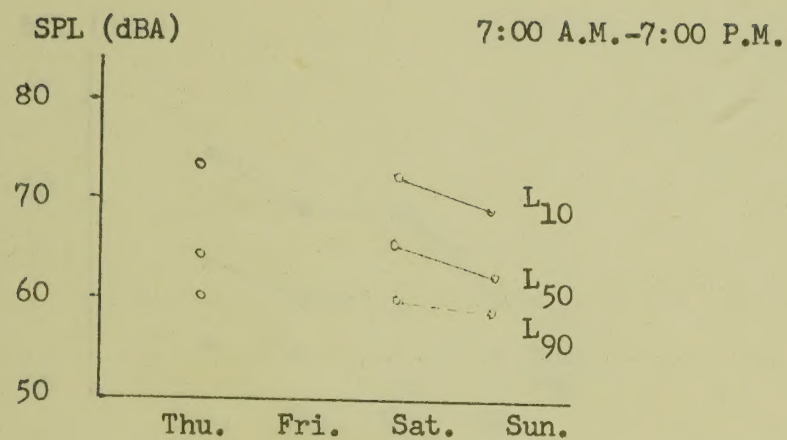
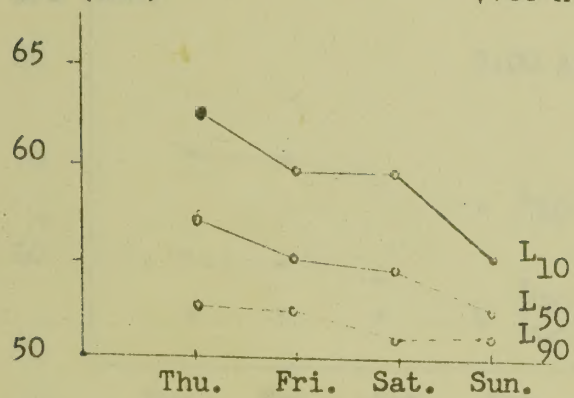
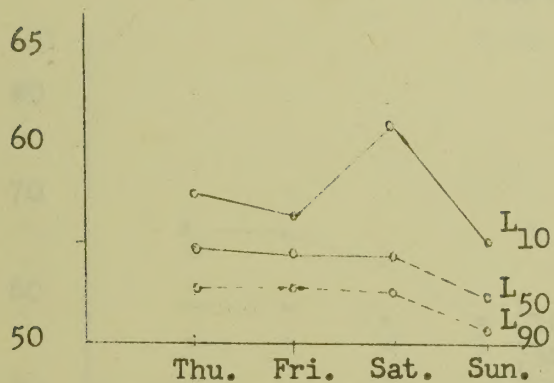


FIGURE 3.12
LOCATION 12 - Wellington and Grove.

SPL (dBA) 7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

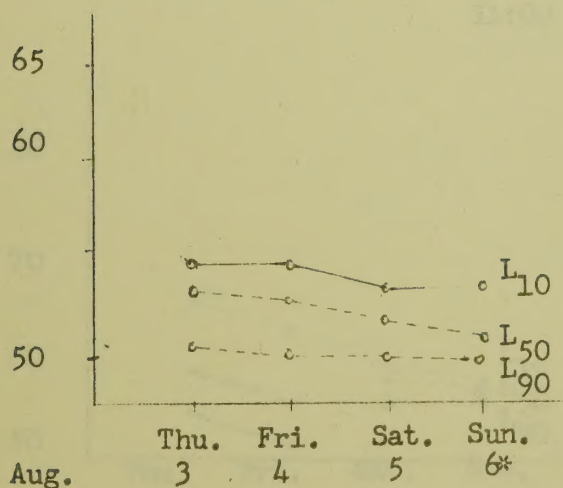


FIGURE 3.13
LOCATION 13 - Burton and Douglas

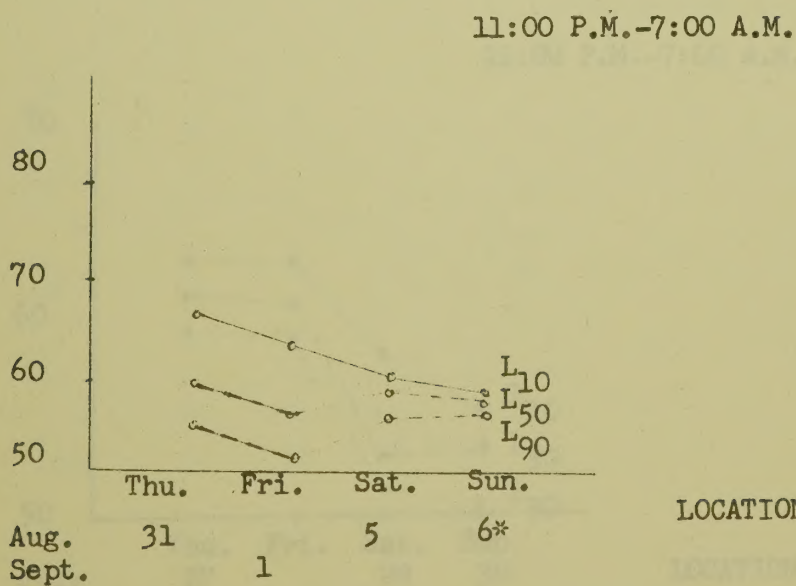
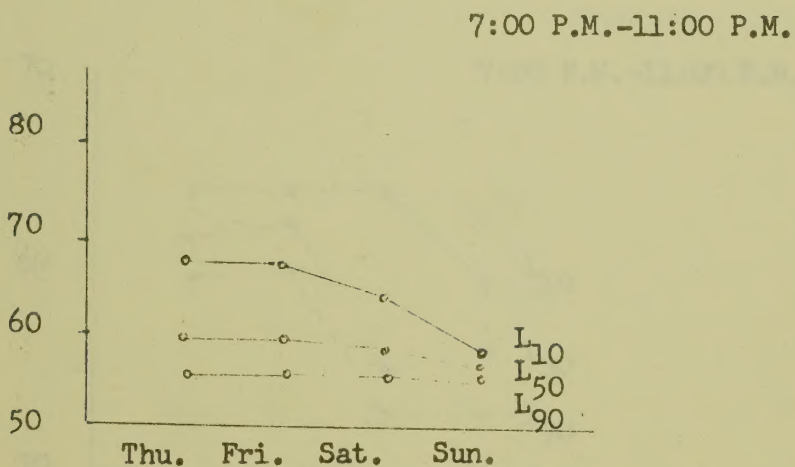
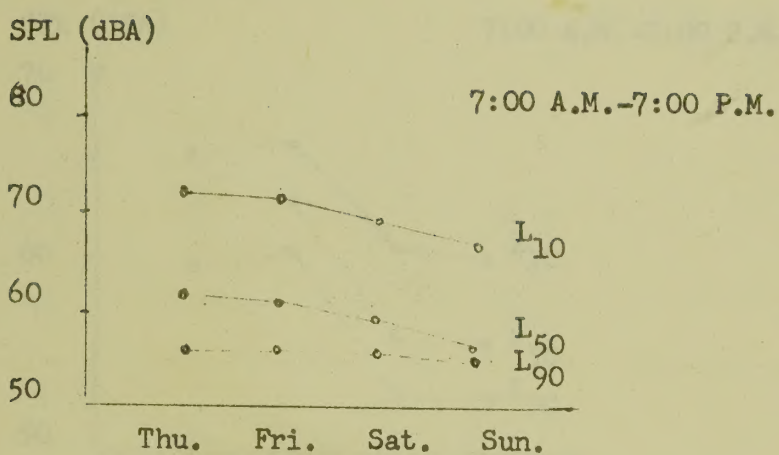
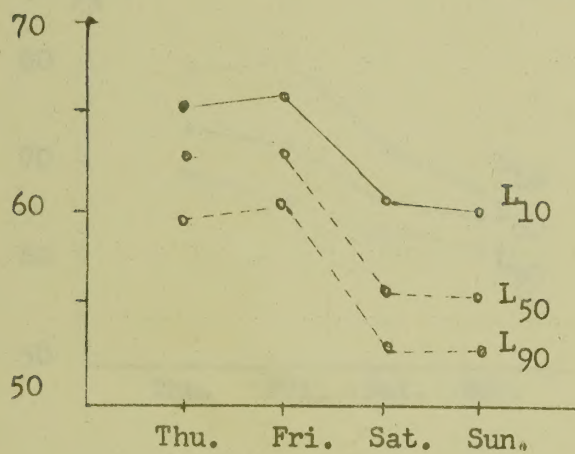
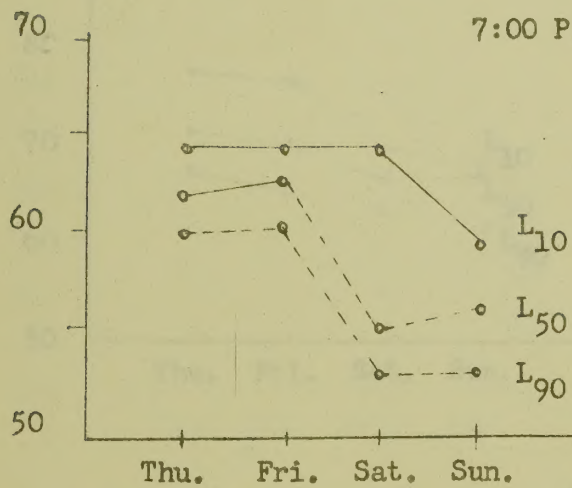


FIGURE 3.14
LOCATION 14 - Victoria and Birch

SPL (dBA) 7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

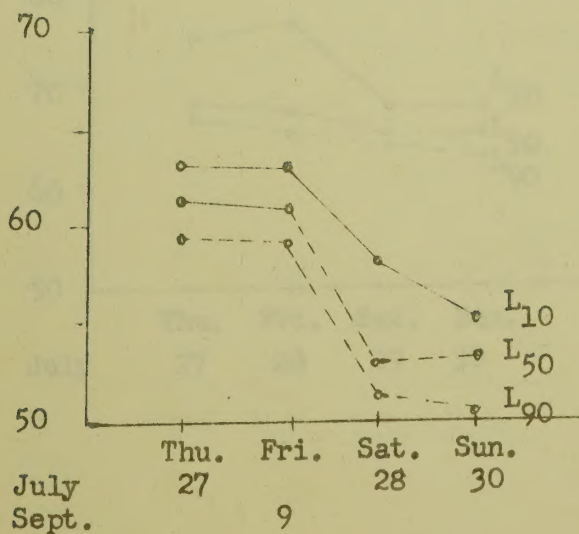
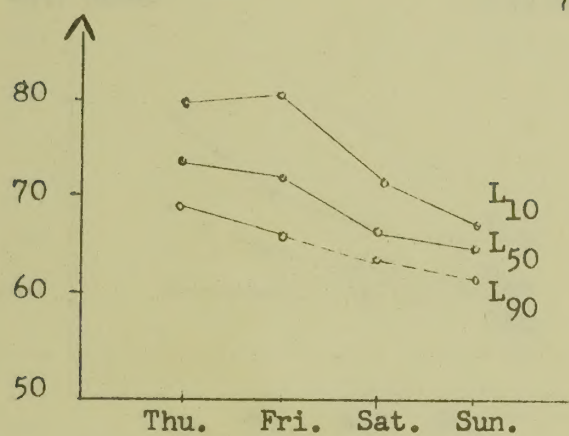


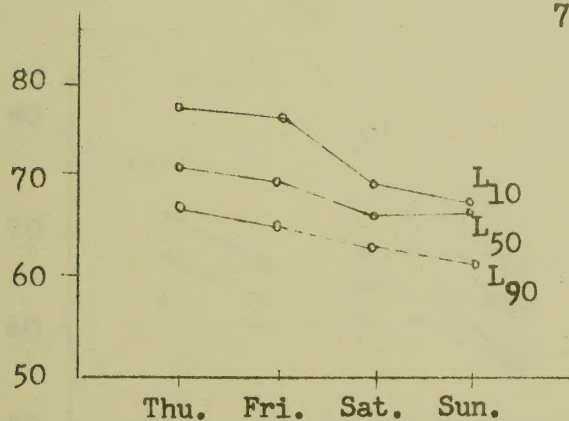
FIGURE 3.15
LOCATION 15 - Westinghouse Ave.

SPL
(dBA)
re: .0002 Microbar

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

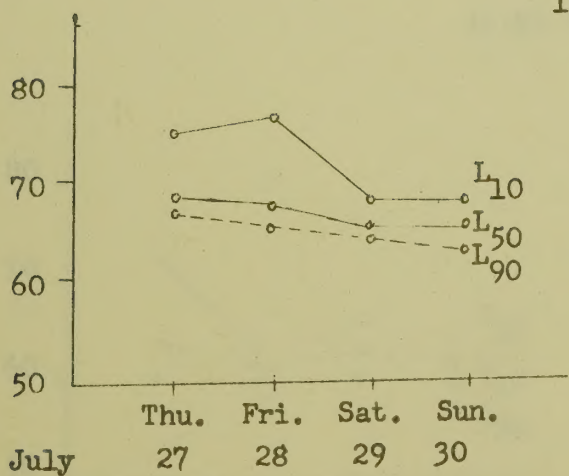
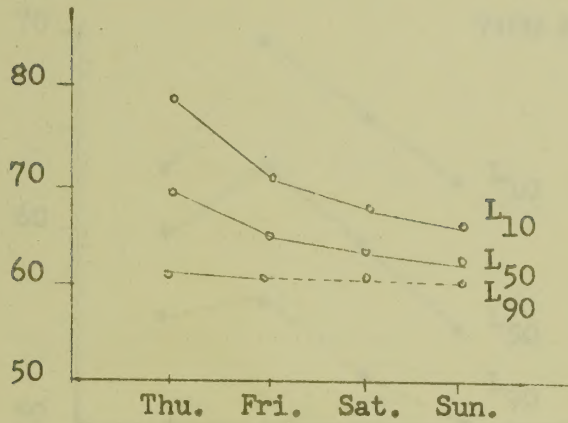


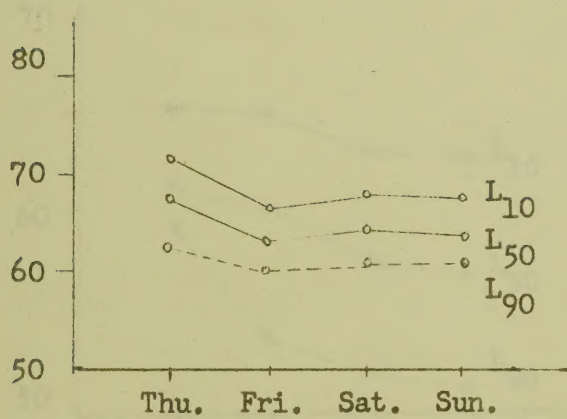
FIGURE 3.16

LOCATION 16 - Wentworth and
Burlington

SPL (dBA) 7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

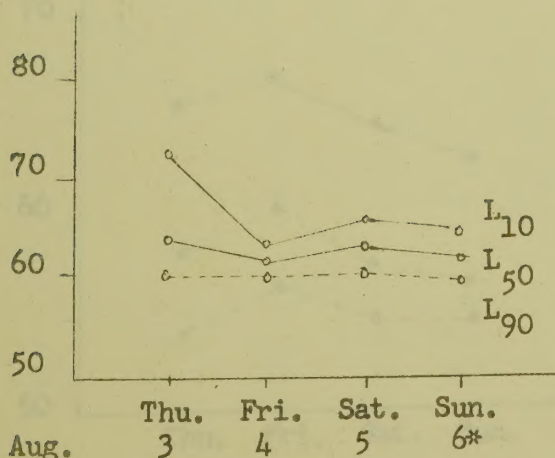
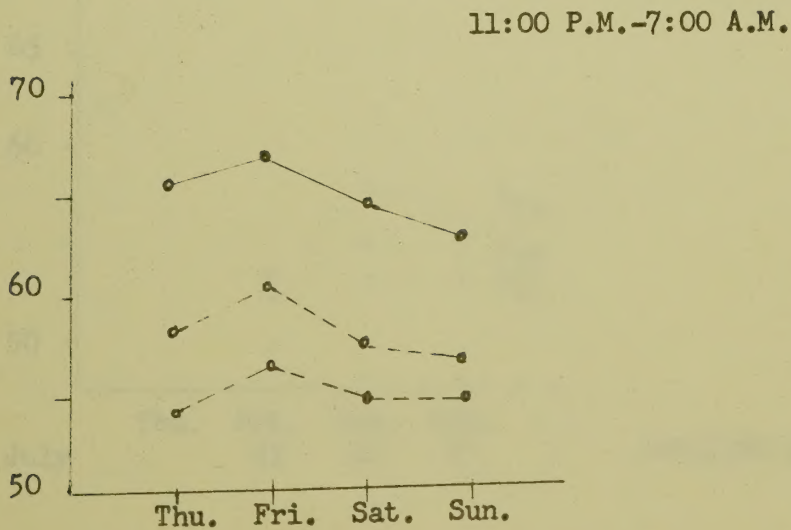
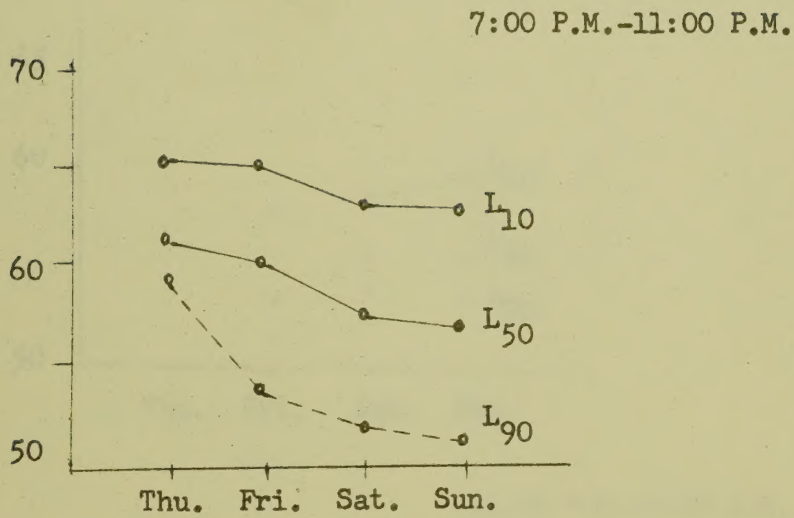
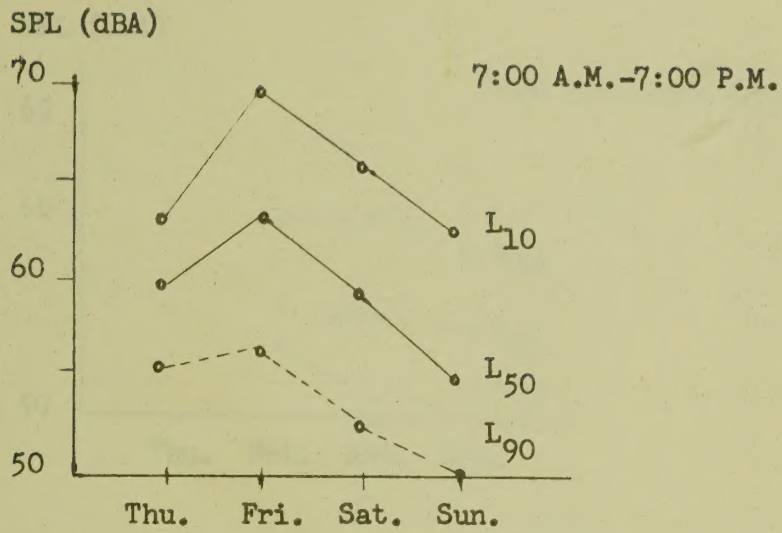


FIGURE 3.17

LOCATION 17 - Barton St.E. and Cheer
(Leeming)



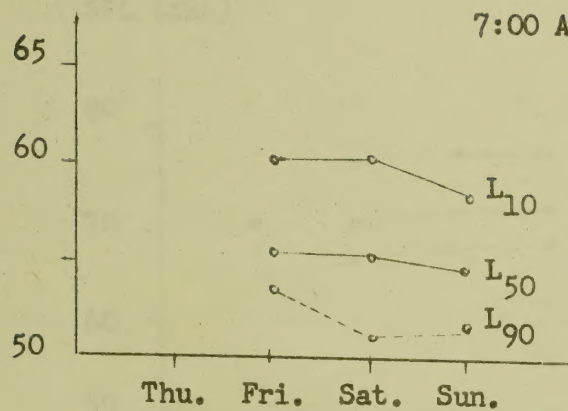
July 27 28 29 30

FIGURE 3.18

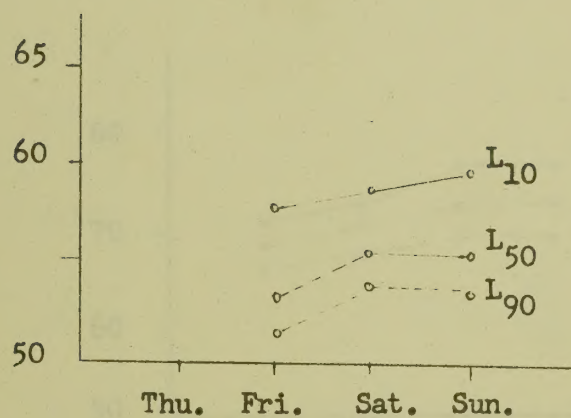
LOCATION 18 - Cannon and Balsam

SPL (dBA)

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

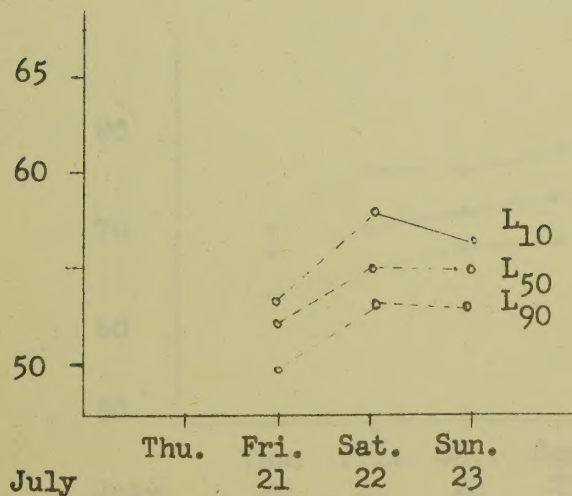
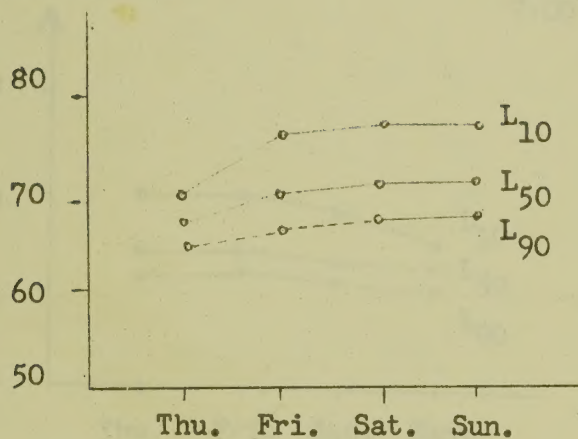


FIGURE 3.19

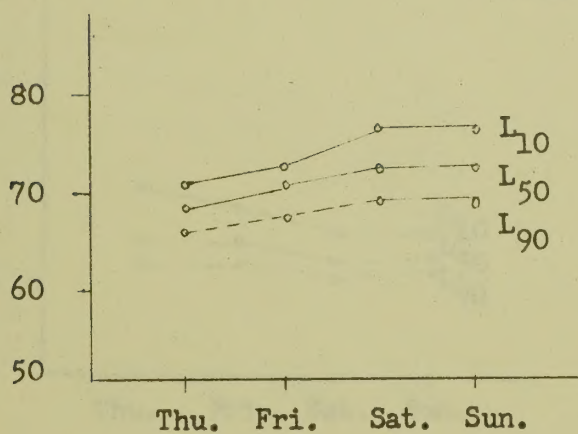
LOCATION 19 - Park-Row N. and Roxborough

SPL (dBA)

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

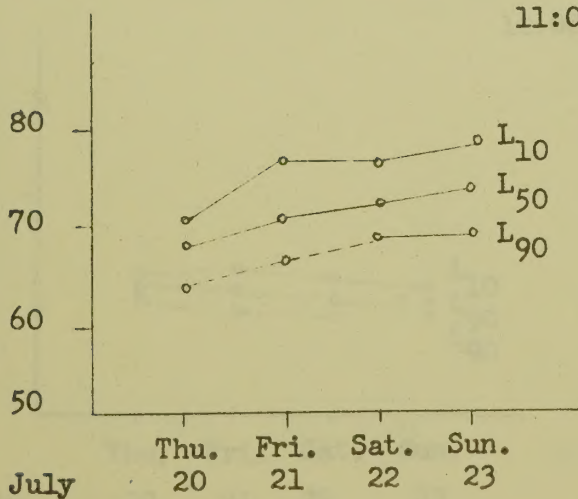
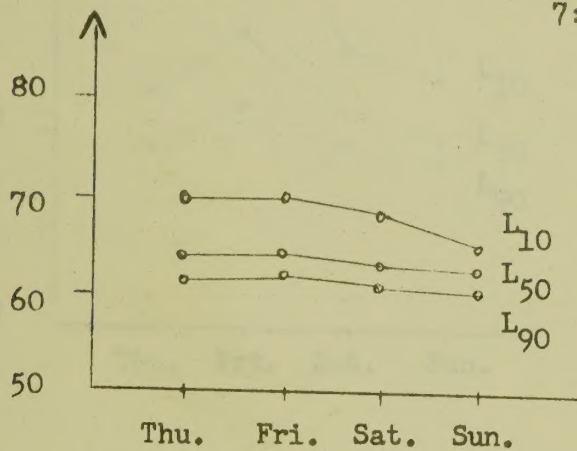


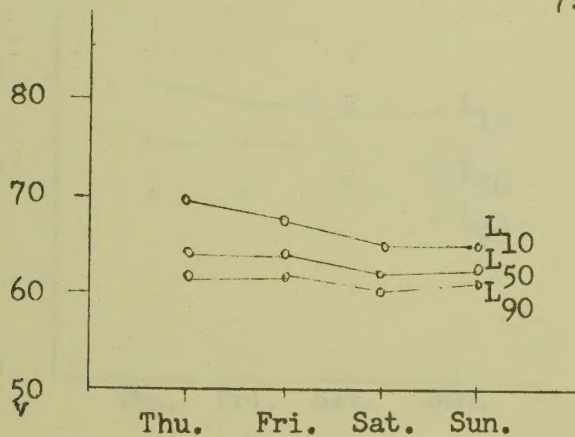
FIGURE 3.20
LOCATION 20 - Ottawa and Main

SPL
(dBA)
re: .0002 Microbar

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

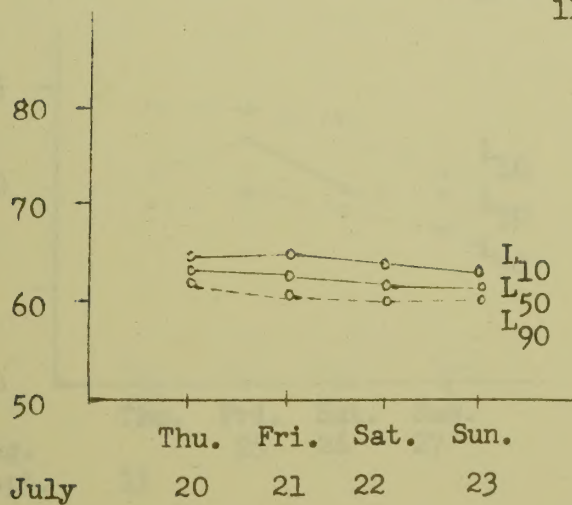


FIGURE 3.21

LOCATION 21 - Grosvenor and
Campbell

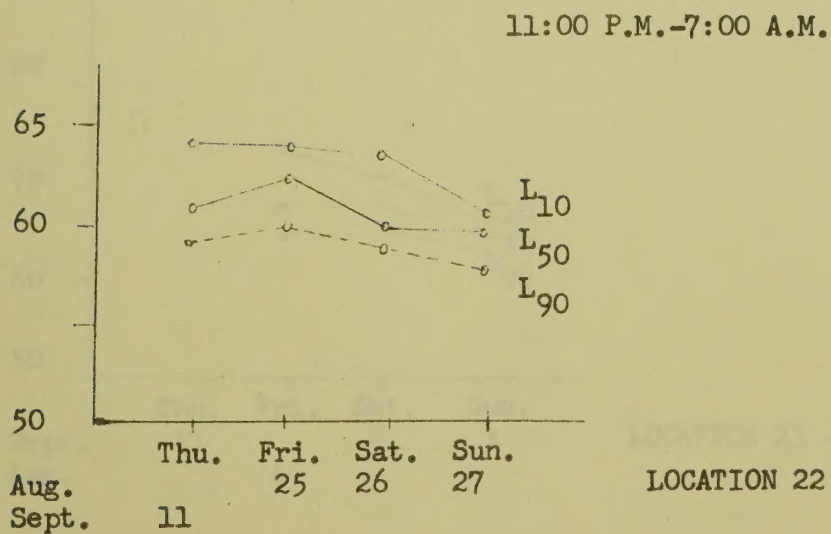
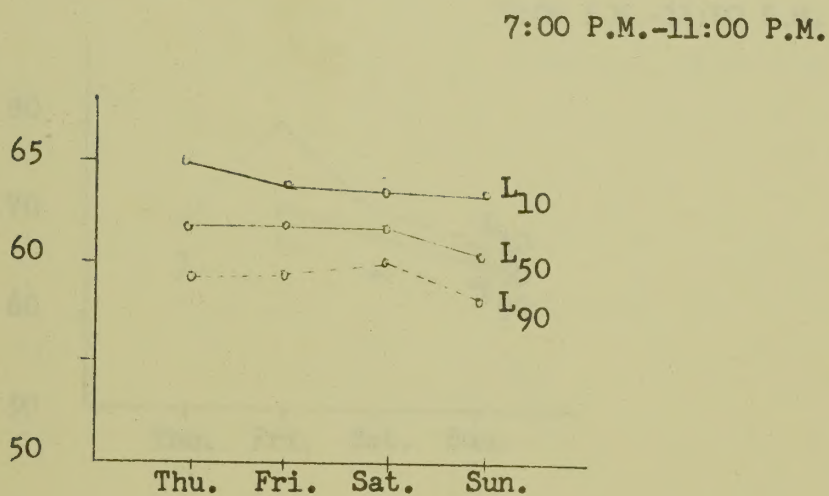
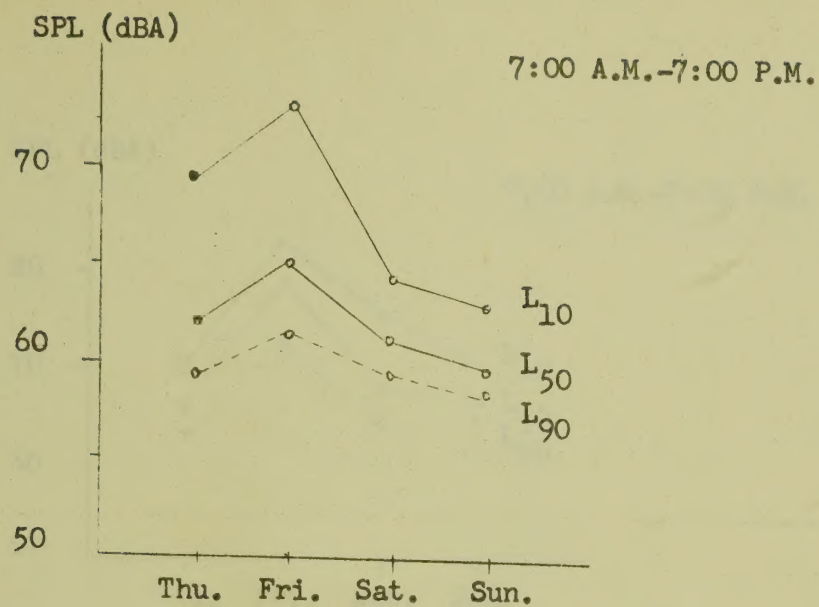


FIGURE 3.22
LOCATION 22 - Depew and Gertrude.

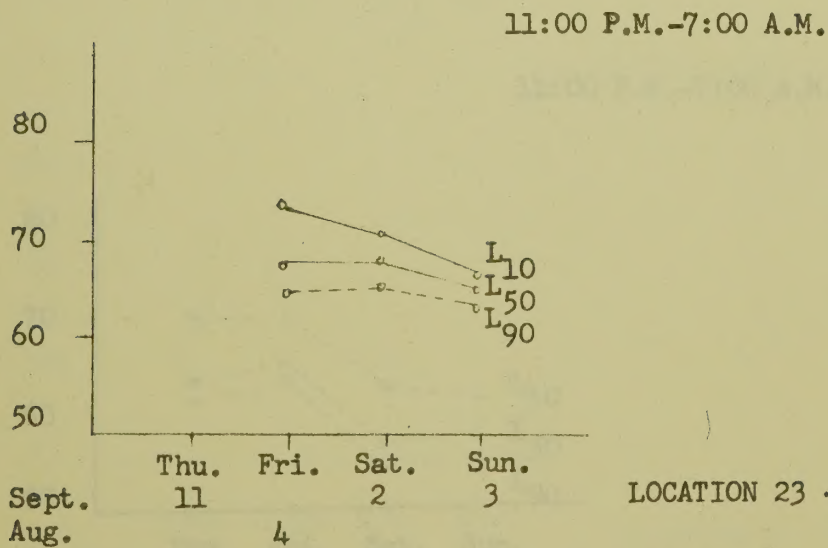
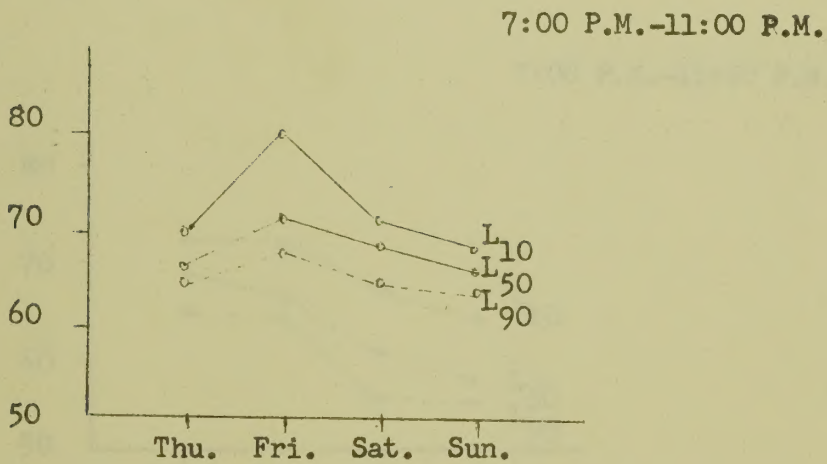
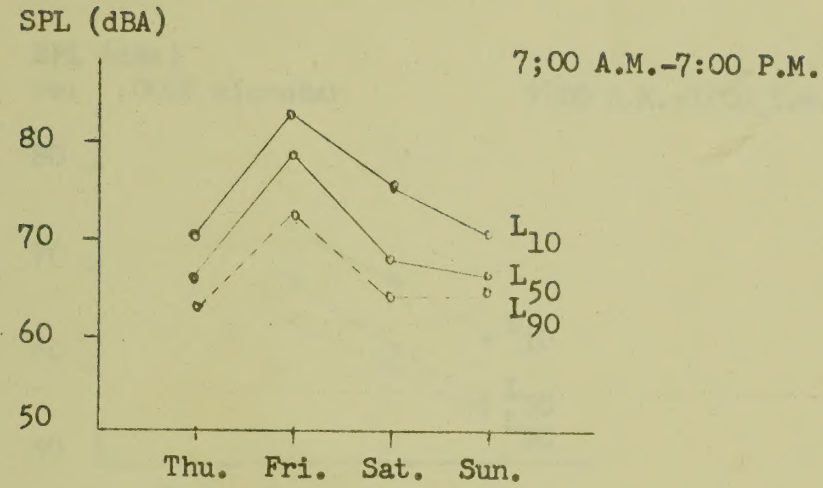
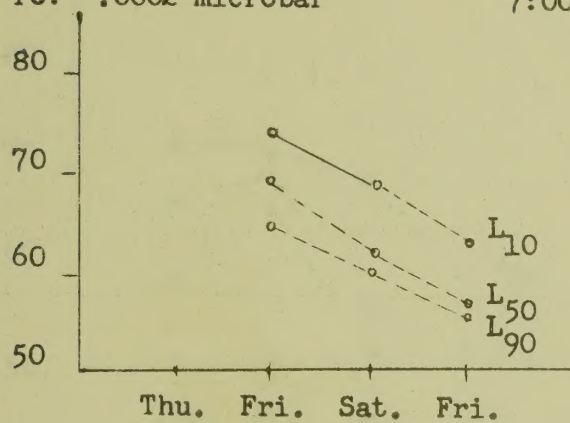


FIGURE 3.23
LOCATION 23 - Stapleton and Burlington St.E.

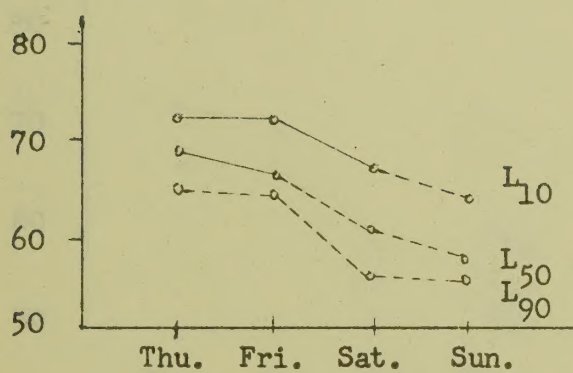
SPL (dBA)

re: .0002 microbar

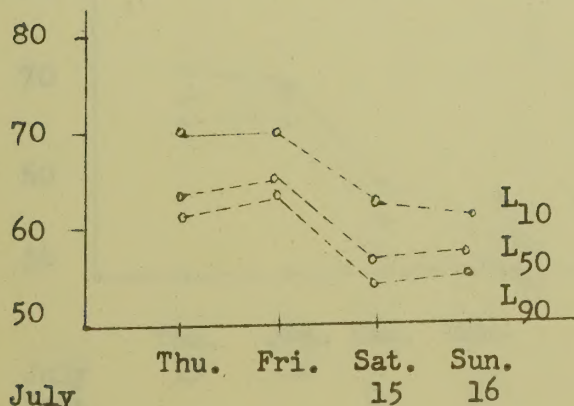
7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.



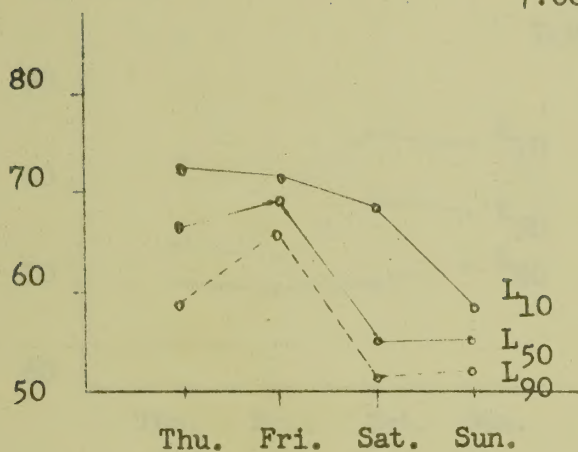
July
Aug.
Sept.

Thu. 31
Fri. 1
Sat. 15
Sun. 16

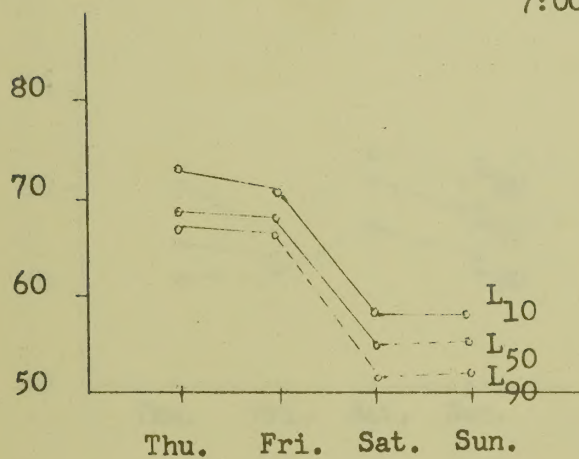
FIGURE 3.24
LOCATION 24 - Kenilworth and Harrison

SPL (dBA)

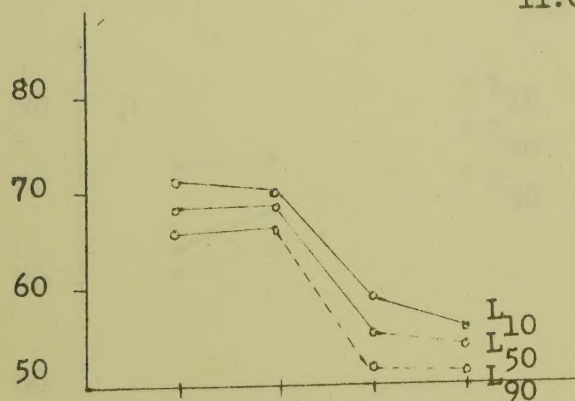
7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.



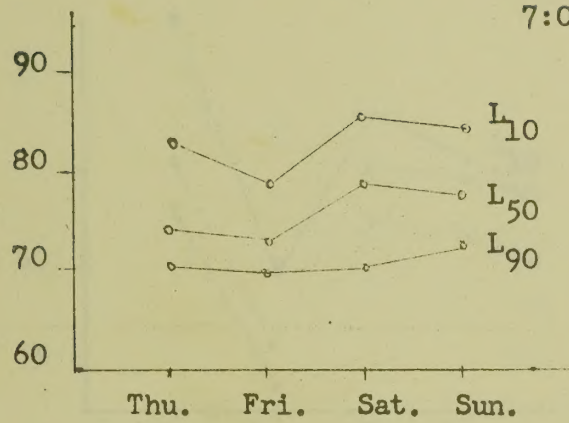
July
 Sept.

Day	Thu.	Fri.	Sat.	Sun.
Month	13	14	2	3*

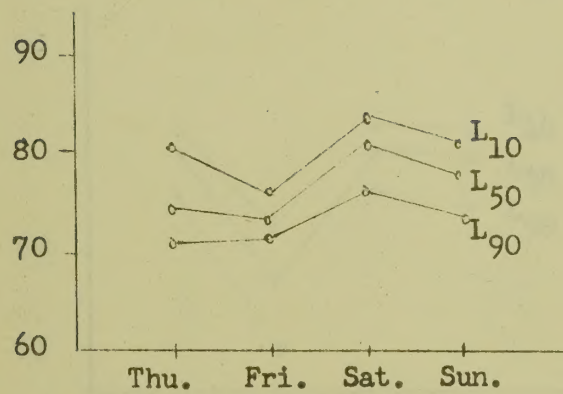
FIGURE 3.25
LOCATION 25 - Dalkeith & Rosslyn

SPL (dBA)

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

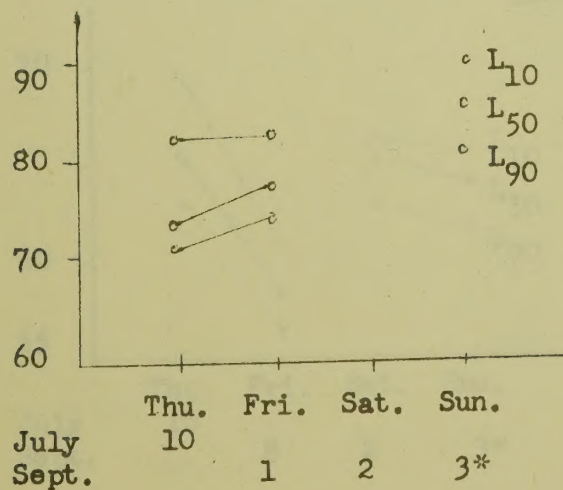
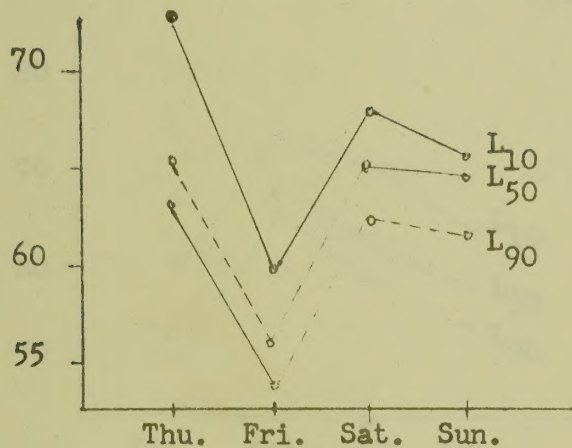


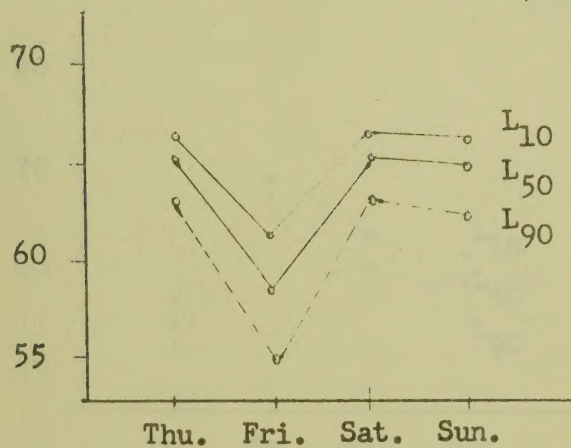
FIGURE 3.26
LOCATION 26 - Beach and Wallace.

SPL (dBA)

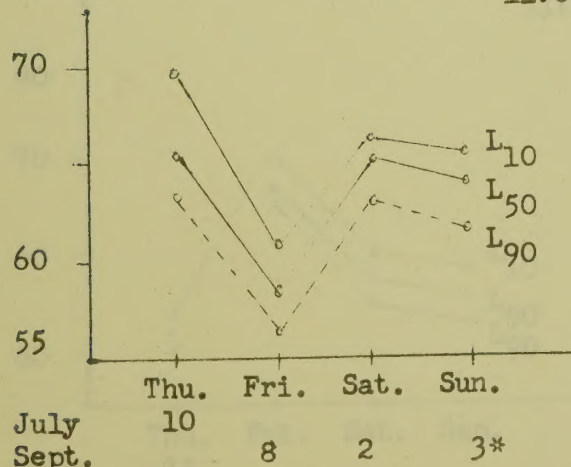
7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

July
Sept.

Thu.

Fri.

Sat.

Sun.

10

8

2

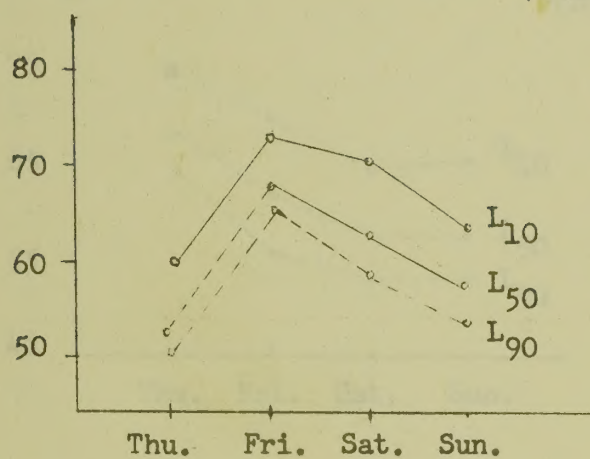
3*

FIGURE 3.27

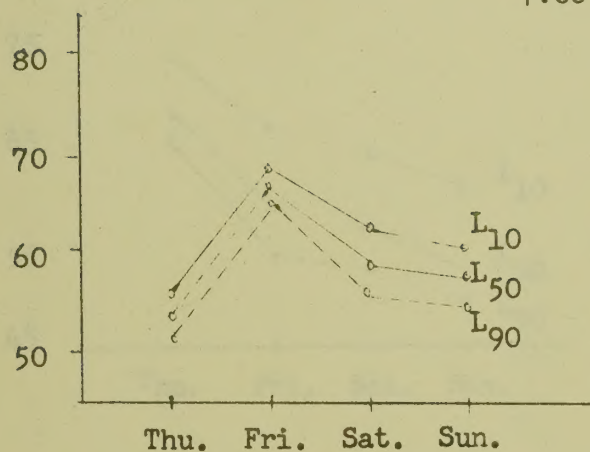
LOCATION 27 - McAnulty and Bayfield

SPL (dBA)

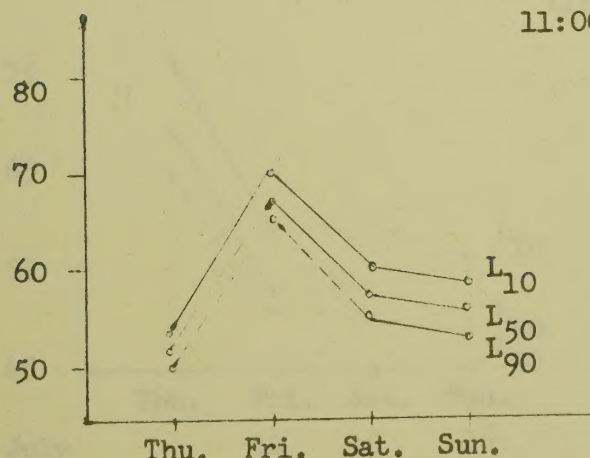
7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

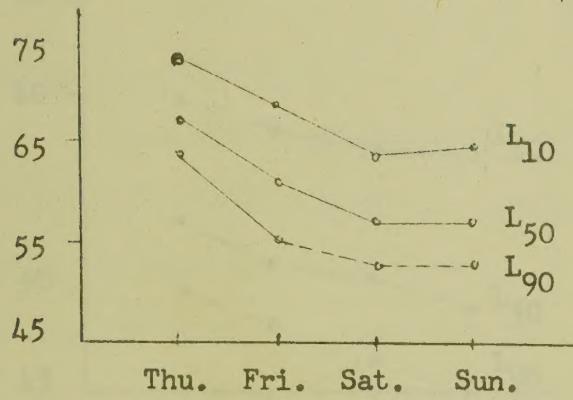
July
Sept.

Thu. 13 Fri. 1 Sat. 2 Sun. 3

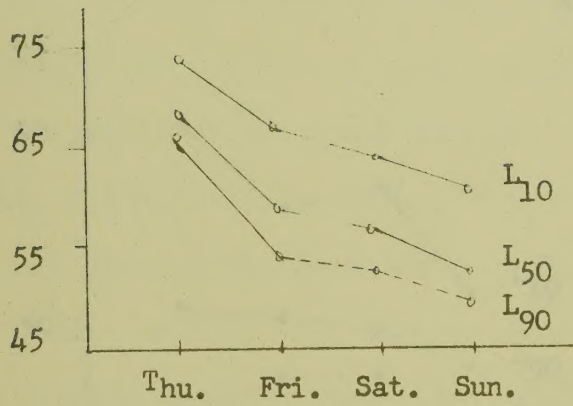
FIGURE 3.28
LOCATION 28 - Stapelton and Grenfell

SPL (dBA)

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

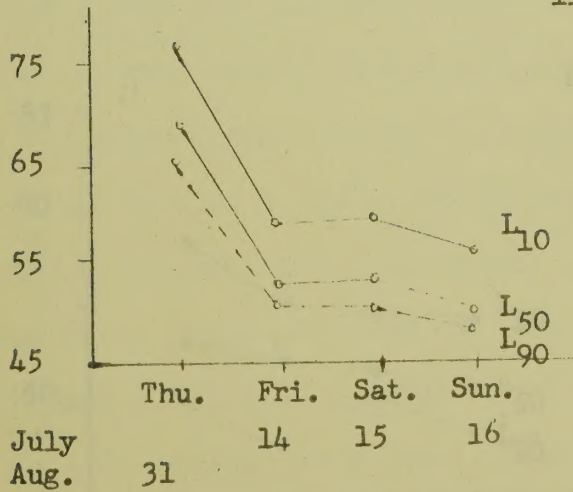
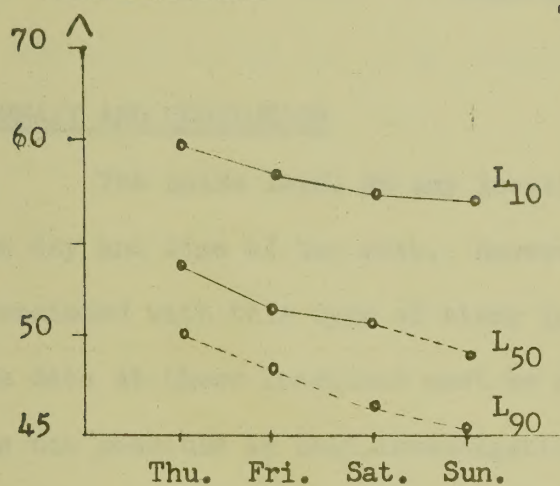


FIGURE 3.29

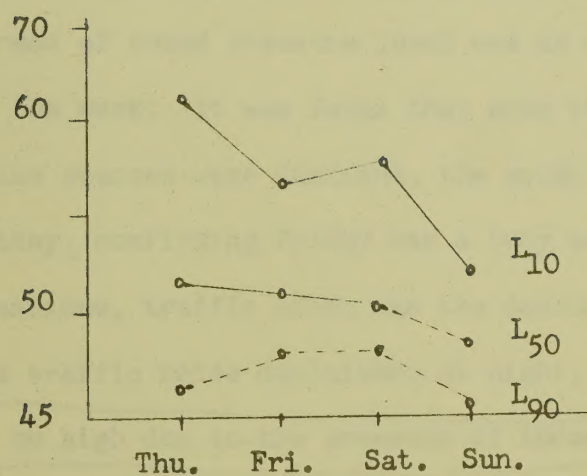
LOCATION 29 - Barton St. E. and Frederick

SPL
(dBA)
re: .0002 Microbar

7:00 A.M.-7:00 P.M.



7:00 P.M.-11:00 P.M.



11:00 P.M.-7:00 A.M.

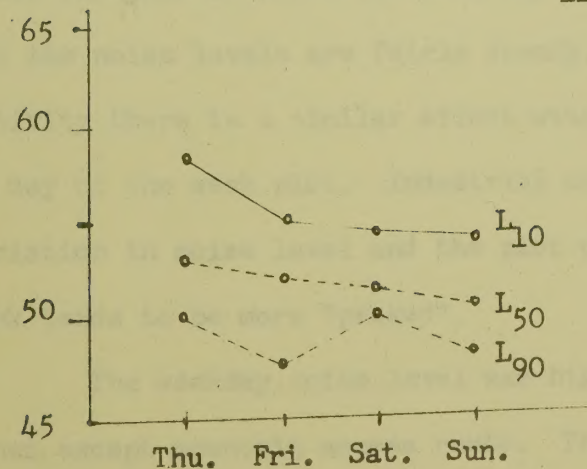


FIGURE 3.30

LOCATION 30 - Crosthwaite and
Britannia

July

20

21

22

23

CHAPTER 4

SUMMARY AND CONCLUSION

The noise level at any location, as expected, is a function of the day and time of the week. However, one of the major problems associated with this type of study is that to draw a definite conclusion the data at these locations must be recorded on the same date. This was not possible in this investigation due to the problem of instrumentation.

At noisy locations, (industrial and commercial zones) the spread of sound pressure level was as much as 20 dBA over quiet period of the week. It was found that when the traffic and the industrial noise sources were dominant, the sound pressure reached a peak on Friday, confirming Friday was a busy activity period. At industrial locations, traffic often was the dominant day time noise source. As the traffic noise diminished at night, the noise level still tended to be high due to the presence of industrial noise which had been masked in the day time by traffic. During quiet times in residential zones the plot of noise level vs day of the week usually has no peak and the noise levels are fairly steady. In areas of busy commercial activity there is a similar effect with a "plateau" in the noise level vs day of the week plot. Industrial zones, however, show a greater variation in noise level and the plot of noise level vs day of the week tends to be more "peaked".

The weekday noise level was higher than weekend ones for all zones except mountain access route. The commercial residential interface and the commercial zones can be classified together as a commercial zone.

The range of sound pressure level (L_{90} and L_{10}) across Hamilton is from 45 to 85 dBA and at no location does the L value in a given period exceed the 90 dBA mark.

In Fig. 4.1 the spread in L_{50} values in different zones of Hamilton is presented and as expected the spread is greatest in industrial residential interface zone and least in a residential zone.

A comparison with noise levels measured in other cities is shown in Table 4.1. It is useful to compare results of the present Hamilton study with results from Ottawa, where community noise levels are considerably lower.

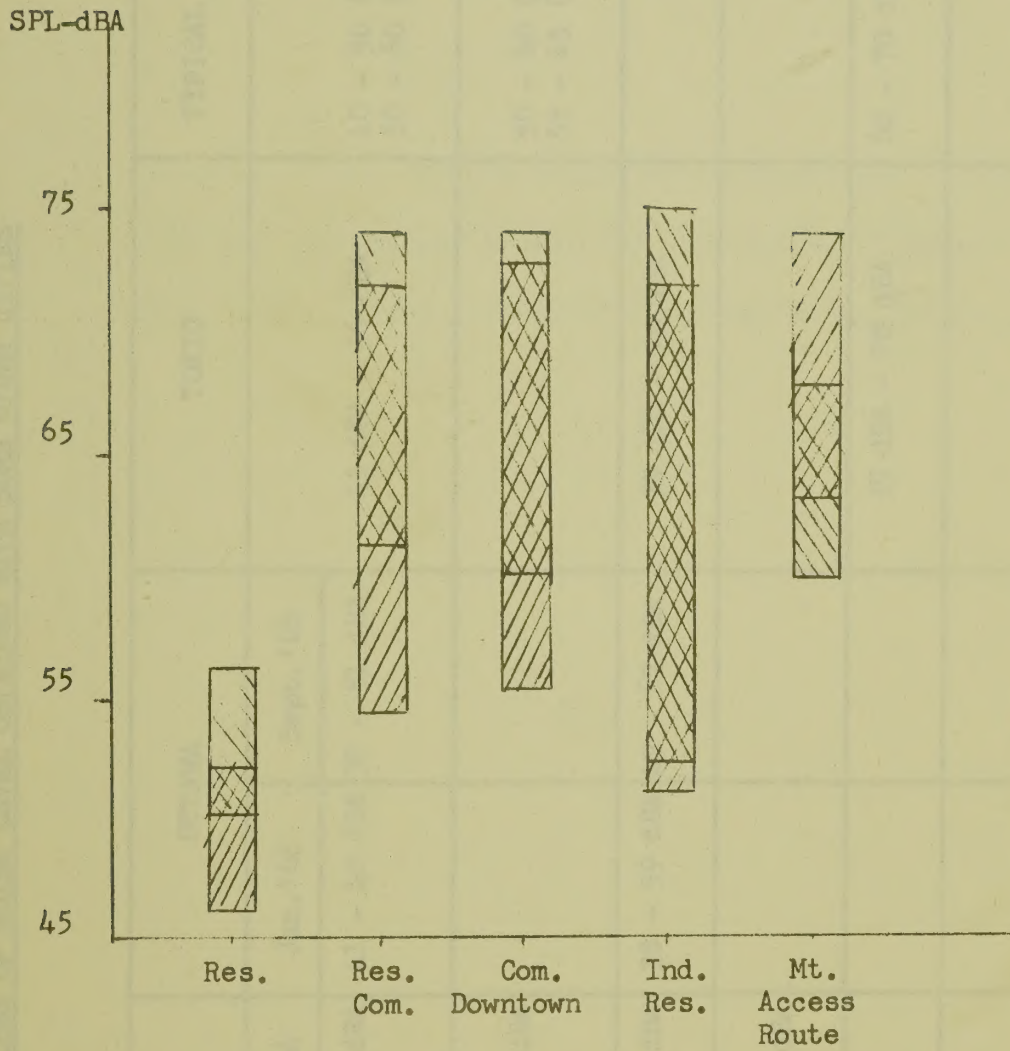
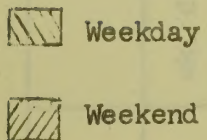


FIG. 4.1: L_{50} Noise Levels in different zones of Hamilton.



COMPARISON OF THE VALUES OF NOISE LEVEL OBTAINED WITH SOME OTHER CITIES

AREA	HAMILTON		OTTAWA		TOKYO	TYPICAL U.S. CITIES*
	wk. days	wk. end	Jan. '68	Sept. '68		
Residential	53 ± 3 dBA	49 ± 3 dBA	41 - 48 dBA	37 - 51 dBA	49 dBA - 56 dBA	40 - 50 (Quiet Area) 50 - 60 (Avg. Res.)
Residential-Commercial Interface	65 ± 4 dBA	60.1 ± 7 dBA				50 - 60 (semi-com. Res.) 55 - 65 (commercial)
Commercial-Downtown	64 ± 5 dBA	61.5 ± 6 dBA	38 - 59 dBA	49 - 62 dBA	59 dBA - 78 dBA	
Industrial-Residential Interface	61 ± 9 dBA	59 ± 8 dBA				
Industrial					59 dBA - 78 dBA	60 - 70 dBA
Downtown Hotel with air conditioning machinery (Industrial)				62 - 71 dBA		
Mountain Access Route	64 ± 4 dBA	66 ± 3 dBA				
Boston Expressway:-	Sound pressure level (SPL) 66-73 dBA, which is of comparable magnitude to the Mountain Access Route.					

NOTE: Above are L₅₀ values.

*Bolt, Beranek and Newman estimates.

REFERENCES

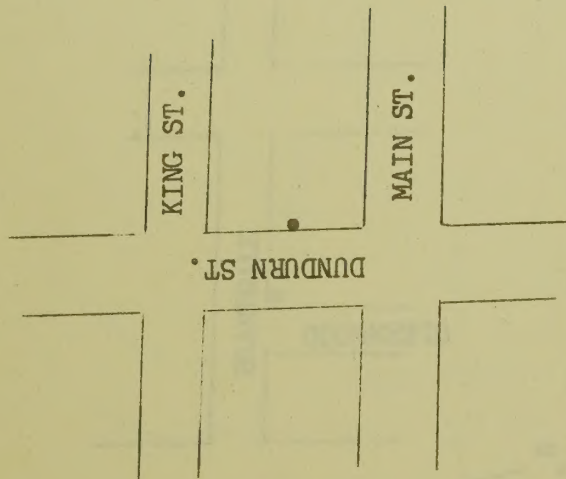
1. Johnston, C.W., "V/STOL Community Annoyance Due to Noise Proposed Indices and Levels for Toronto-York Transportation Committee", Canada Transportation Commission, March, 1972.

APPENDIX A

In this section, the various locations at which noise measurements were taken are sketched with a brief description of the location environment.

The noise measurements were taken during summer months of July to September of 1972, a busy period for highway construction and repair with the resulting increase in the sound pressure levels.

LOCATION 1 - Durdurn St. between Main St.
and King St. W.



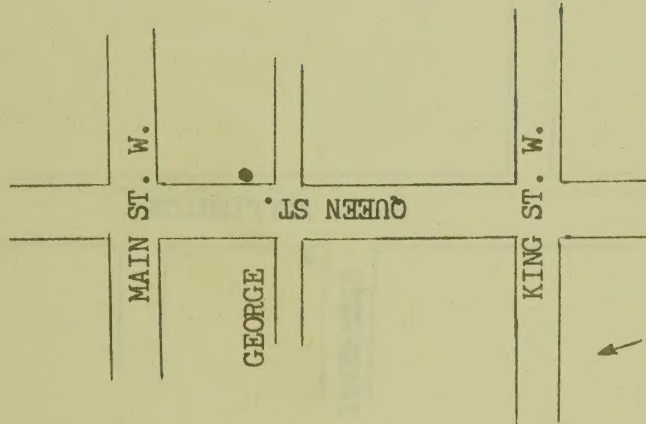
Location of noise measurement
Map not drawn to scale

Location Description:

This site is at an interface of industrial and residential areas.

The main noise sources are traffic flow and industrial activity especially that of Slater Steel Co.

LOCATION 2 - Queen St. between King St. W.
and Main St. W.



Location of noise measurements
Map not drawn to scale

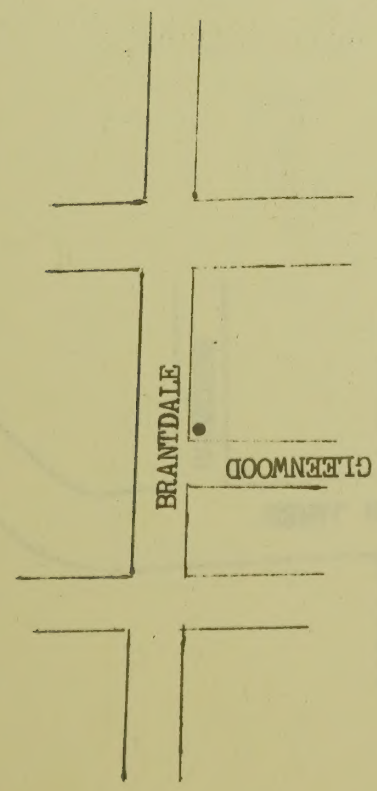
Location Description:

This site is located just west of downtown Hamilton. It is at the interface of residential and commercial areas with fairly steady traffic flow as it is a mountain access route.

The traffic on King St. W. and Main St. W. is quite heavy at all times of day.

The major source of noise is traffic noise, mainly automobiles but with some heavy trucks.

LOCATION 3 - Brantdale and Gleenwood



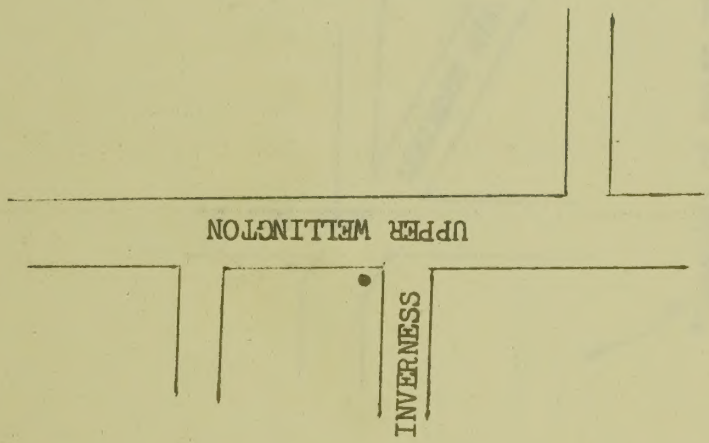
• Location of noise measurement
Map not drawn to scale

Location Description:

This is a quiet residential area located on the 'mountain'. A hospital and a school are close by.

Light residential traffic.

LOCATION 4 - Upper Wellington and Inverness

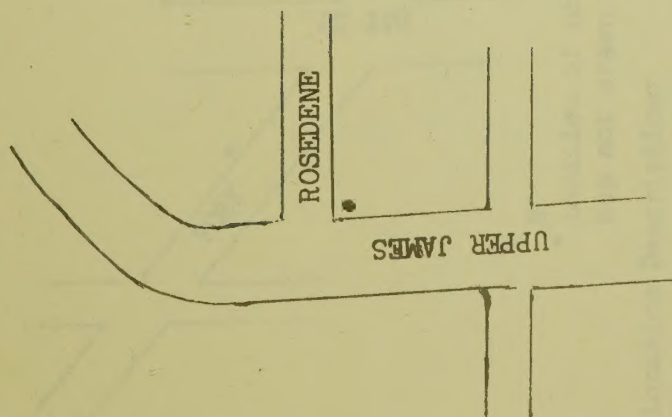


• Location of noise measurement
Map not drawn to scale

Location Description:

This site is located on the 'mountain' and is at the interface of residential and commercial areas. Traffic is the main noise source. There is light traffic flow on Inverness. On Upper Wellington there is steady moderate traffic flow.

LOCATION 5 - Upper James and Rosedene



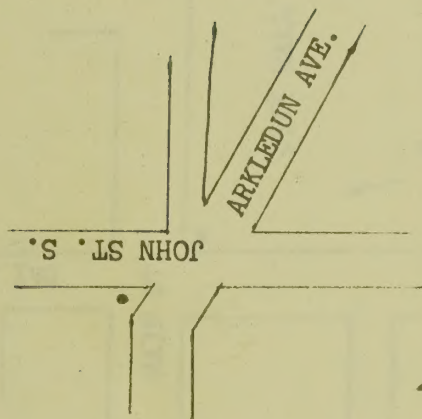
- Location of noise measurement
Map not drawn to scale

Location Description:

This is a residential area situated near a busy mountain access route.

Noise is mainly due to the heavy traffic flow on Upper James.

LOCATION 6 - John St. S. and Arkledun Ave.



- Location of noise measurement
Map not drawn to scale

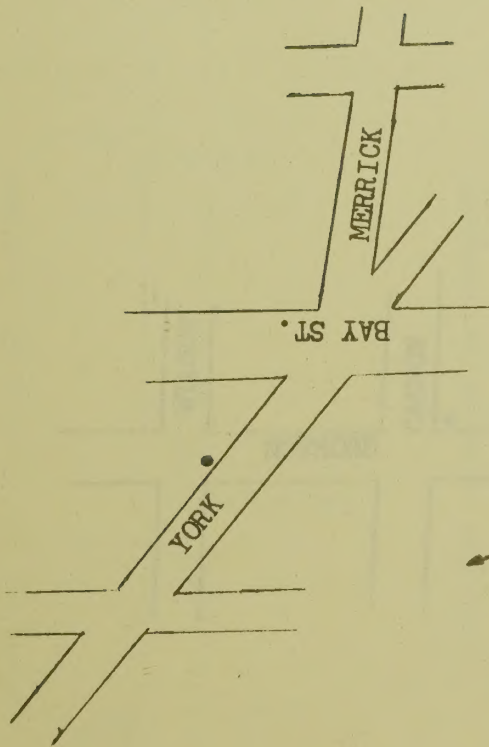
Location Description:

This site is located near a mountain access route, close to the downtown area.

St. Joseph's Hospital and high rise apartments are near the site.

The dominant source of noise is due to heavy traffic flow on John St. S. and Arkledun Ave.

LOCATION 7 - Bay St. and York St.

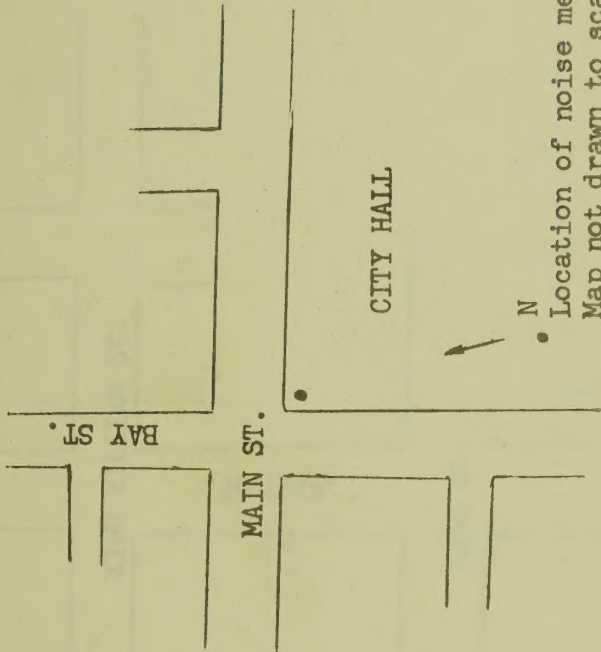


N
• Location of noise measurement
Map not drawn to scale

Location Description:

This is a commercial area in downtown Hamilton. There are some residences nearby. Heavy traffic flow, consisting of trucks and cars on York and Bay St.
The main noise source is traffic.

LOCATION 8 - Main St. W. and Bay



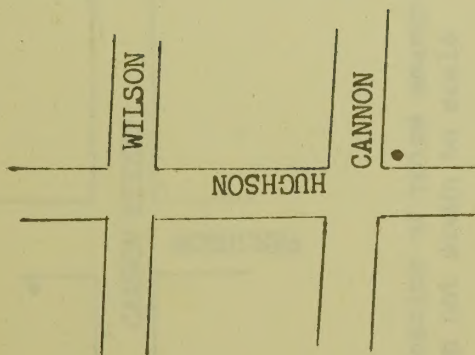
N
• Location of noise measurement
Map not drawn to scale

Location Description:

This location is situated in downtown Hamilton opposite City Hall. It is a commercial area with constant heavy traffic of automobiles and buses on Main St.

The main noise source is traffic.

LOCATION 9 - Hughson and Wilson



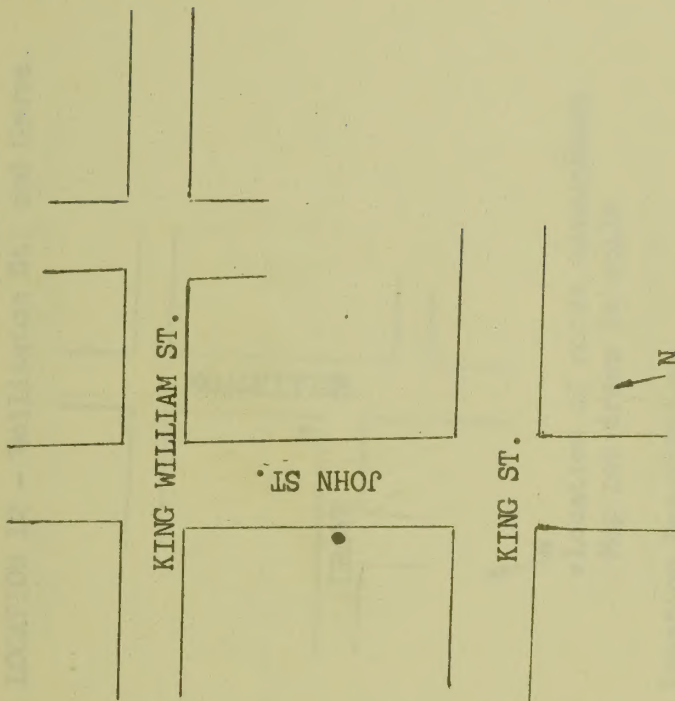
- Location of noise measurements
- Map not drawn to scale

Location Description:

This is a downtown commercial area and it is a heavy traffic route. Bus depot nearby.

The major source of noise is due to traffic consisting of commercial vehicles, including buses and trucks.

LOCATION 10 - King St. and John St.



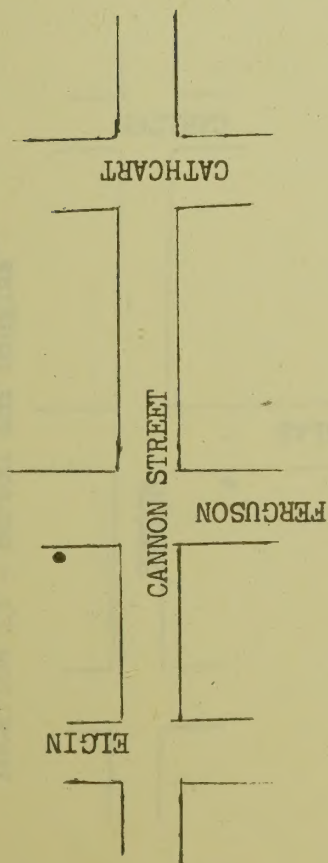
- Location of noise measurement
- Map not drawn to scale

Location Description:

This location is situated in a downtown commercial area and is the busiest area for commercial activity.

The traffic flow is heavy and consists mainly of cars and buses. Traffic and commercial activities are the main sources of noise.

LOCATION 11 - Cannon and Ferguson



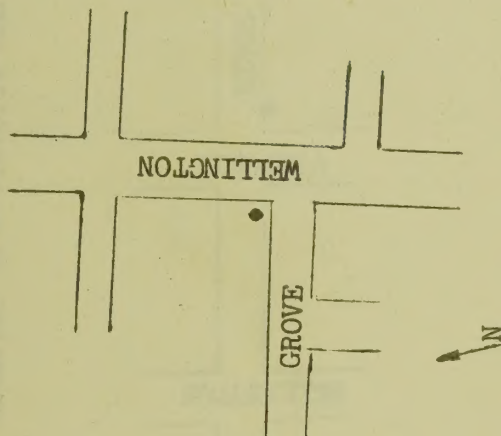
- Location of noise measurement
Map not drawn to scale

Location Description:

This site is located at the interface of industrial and residential areas close to downtown. Some commercial activity such as garages and stores closeby.

Noise is mainly due to the heavy traffic flow, mainly cars and trucks, on Cannon St.

LOCATION 12 - Wellington St. and Grove



- Location of noise measurement
Map not drawn to scale

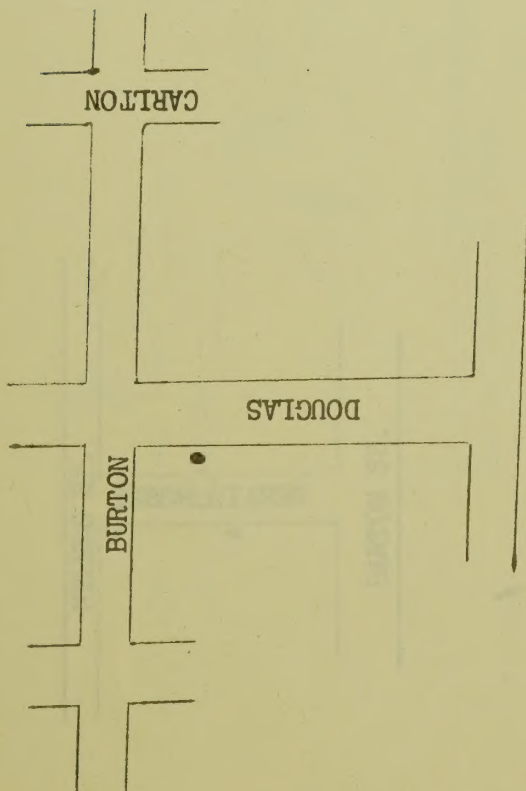
Location Description:

This is a residential area in downtown Hamilton.

There is a fairly heavy traffic flow on Wellington, a mountain access route, and traffic is the main noise source.

There are CNR tracks and a freight office in close proximity.

LOCATION 13 - Burton and Douglas



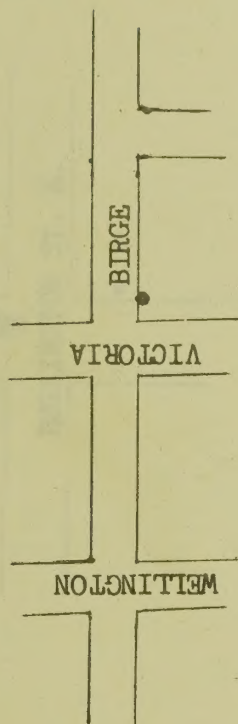
- Location of noise measurement
Map not drawn to scale

Location Description:

This location is situated at a light industrial residential interface.

T.H. & B.R. rail tracks nearby. Light traffic on Burton St. and noise is due to light industries nearby and traffic flow.

LOCATION 14 - Victoria and Birge



- Location of Noise measurement
Map not drawn to scale

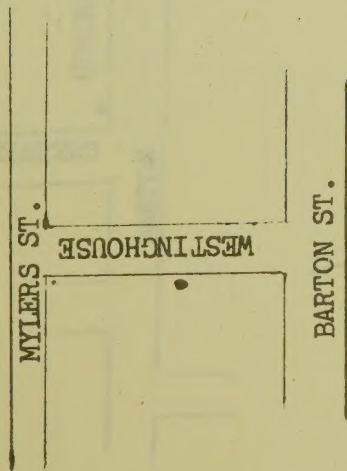
Location Description:

This location is situated at the interface of industrial and residential areas.

Stelco Steel plant is on the opposite side of Victoria and CNR rail tracks are on the opposite side of Birge.

The main source of noise is due to industries and traffic and railways.

LOCATION 15 - Westinghouse Ave.



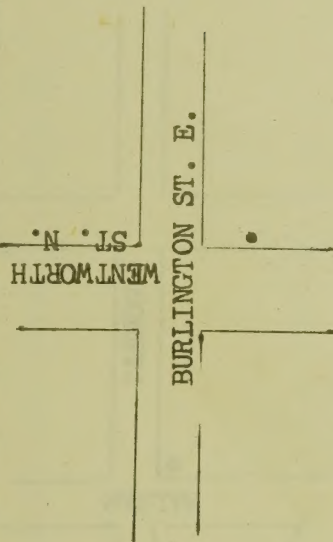
- Location of noise measurement
- Map not drawn to scale

Location Description:

This site is located at the interface of commercial, residential and light industrial areas.

Barton St. is a busy traffic route for commercial vehicles, trucks and automobiles. Noise is due to traffic and industry (Westinghouse Electrical Engineering Plant is closeby)

LOCATION 16 - Wentworth and Burlington St. E.



- Location of noise measurement
- Map not drawn to scale

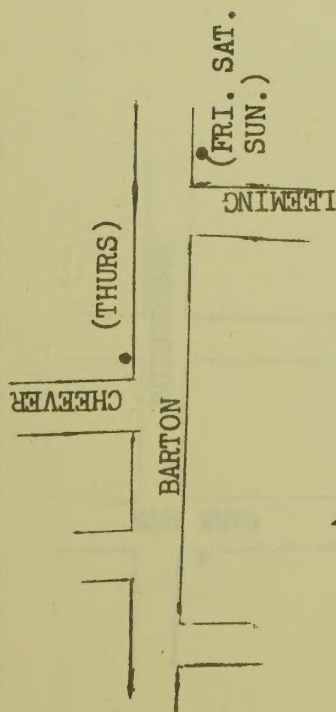
Location Description:

This is a location at the interface of industrial and residential areas.

Burlington St. E., a heavy truck route, is in close proximity of the noise monitoring station. The noise at the location point is due to traffic and industrial plants.

C.N.R. rail tracks are nearby.

LOCATION 17 - Barton and Cheever (Leeming)



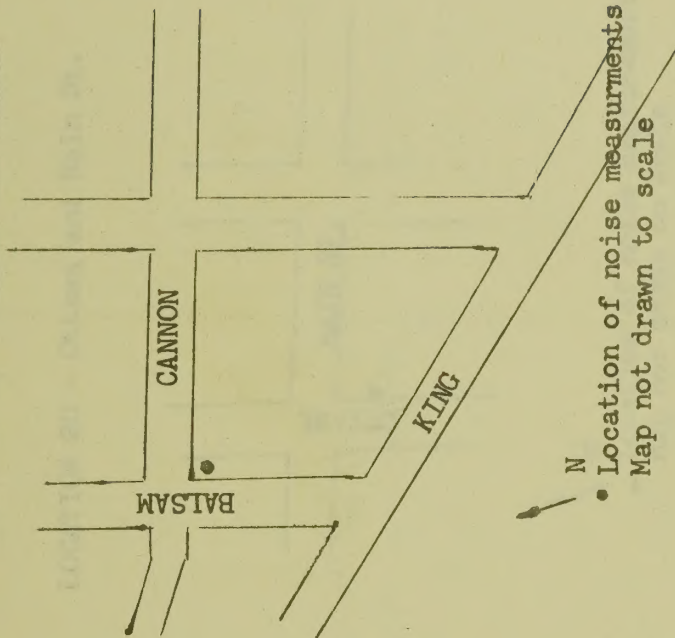
- Location of noise measurement
Map not drawn to scale

Location Description:

The site is situated at the interface of residential and commercial areas and is located on a busy traffic route.

Traffic flow on Barton St. is heavy and consists of heavy trucks, buses, and cars. The main noise source is due to traffic and commercial activity.

LOCATION 18 - Cannon and Balsam



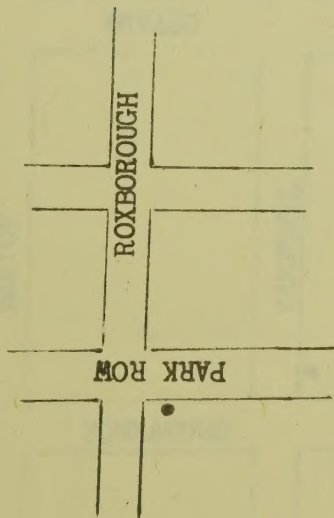
- Location of noise measurements
Map not drawn to scale

Location Description:

This is a commercial residential area in the city centre. The civic stadium and a park face the site.

Heavy traffic flow of cars and trucks on Cannon St. is the dominant noise source. On weekends especially when there is a sports game at the stadium there is exceptionally heavy traffic flow on King E. and Cannon.

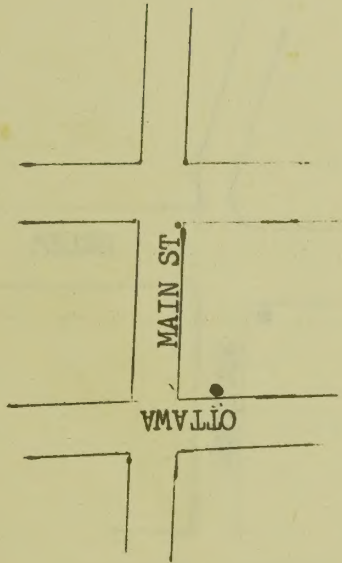
LOCATION 19 - Park Row and Roxborough



- Location of noise measurement
- Map not drawn to scale

Location Description:

LOCATION 20 - Ottawa and Main St.

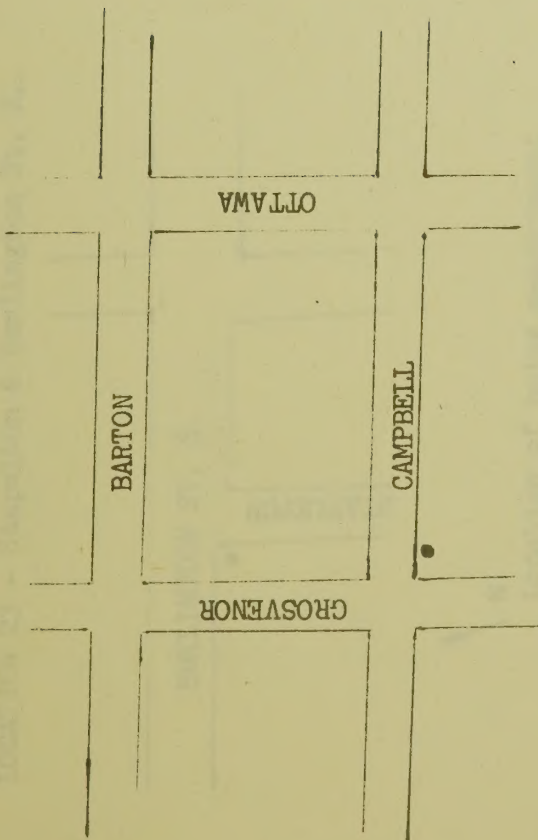


- Location of noise measurement
- Map not drawn to scale

Location Description:

This is a residential commercial site with heavy traffic flow on both Ottawa and Main St. The main source of noise is the traffic noise.

LOCATION 21 - Grosvenor and Campbell



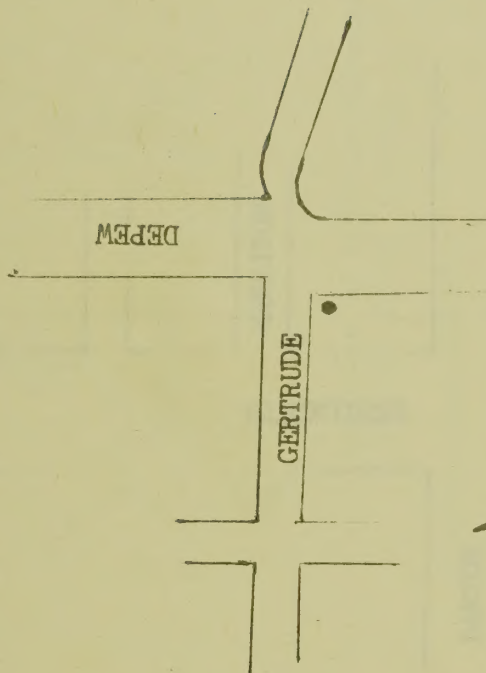
- Location of noise measurement
Map not drawn to scale

Location Description:

This is a residential area close to a commercial area.

The main source of noise is traffic noise.

LOCATION 22 - Depew and Gertrude



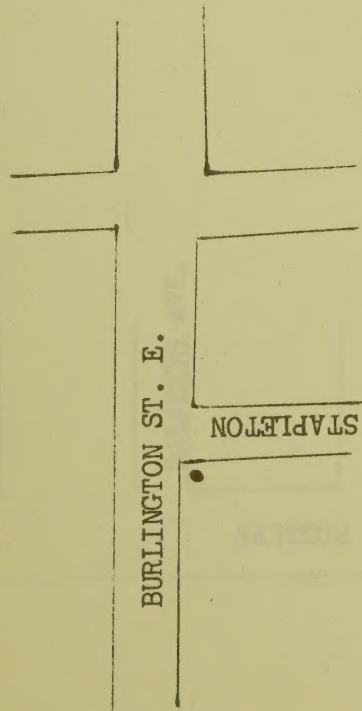
- Location of noise measurement
Map not drawn to scale

Location Description:

This site is located in the heavy industrial area of Hamilton. Dofasco Steel plant is a few hundred feet away and the site is facing a concrete mixing plant.

The location is at the interface of industrial and residential areas and the main source of noise is from industry. There are railway tracks closeby.

LOCATION 23 - Stapelton & Burlington St. E.



- Location of noise measurement
- Map not drawn to scale

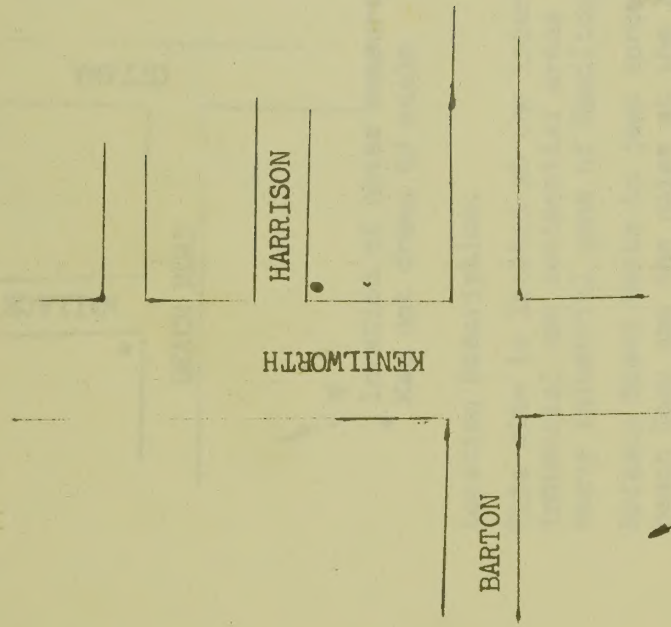
Location Description:

This site is located in the heavy industrial area of Hamilton.

There was heavy highway construction activity near the site and Dofasco Steel Works is opposite.

The location is in a very noisy area and the noise is due to industries closeby, construction work and the heavy truck traffic flow on Burlington St. E.

LOCATION 24 - Kenilworth & Harrison



- Location of noise measurement
- Map not drawn to scale

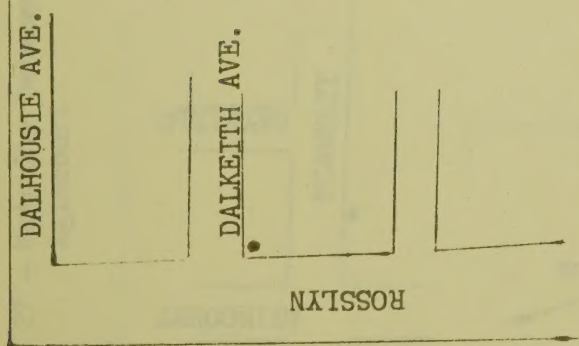
Location Description:

This site is situated at the interface of commercial and residential areas and is in close proximity to a heavy industrial area. The Greater Hamilton Shopping Centre faces the location.

On Kenilworth in addition to usual commercial traffic there is some heavy truck traffic.

The noise is due mainly to traffic.

LOCATION 25 - Dalkeith Ave. and Rosslyn



- Location of noise measurement
- Map not drawn to scale

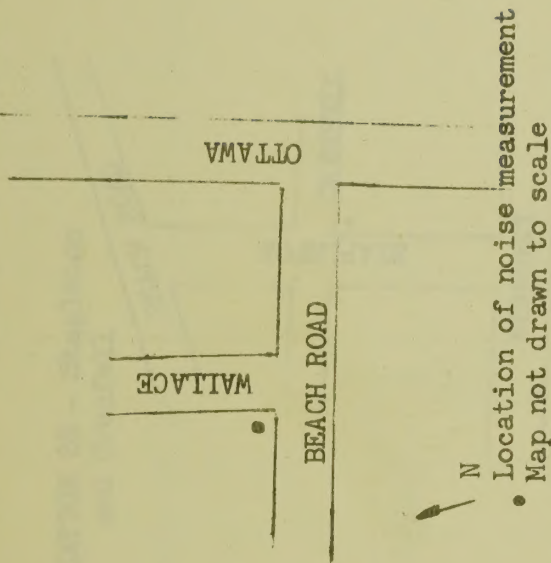
Location Description:

This site is at the interface of industrial and residential areas in a heavy industrial area of Hamilton.

T.H. & B. railtracks are a few hundred feet away. The commercial district of Barton St. is closeby and there is a playground facing the site.

The noise is due to the heavy traffic flow on nearby Barton St. and the background industrial noise in the distance.

LOCATION 26 - Wallace and Beach Road



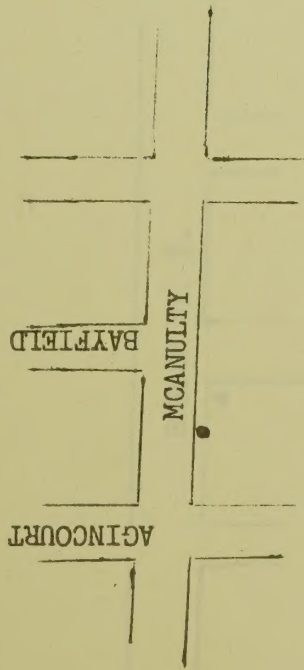
- Location of noise measurement
- Map not drawn to scale

Location Description:

This site is located at the interface of industrial and residential areas in the heavy industrial zone of Hamilton.

Dofasco Steel Works is just across the Beach Road and the noise at the location is due to the heavy industrial traffic and Dofasco Steel Works.

LOCATION 27 - McAnulty between Bayfield and Agincourt



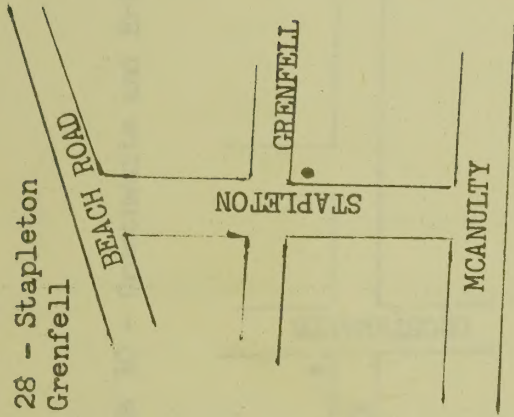
- N
- Location of noise measurement
- Map not drawn to scale

Location Description:

This residential location is sandwiched between a heavy industrial area to the north and a commercial area to the south. Dofasco Steel Works is a few hundred yards away and CNR rail tracks are close by the location.

Industry is the dominant source of noise.

LOCATION 28 - Stapleton and Grenfell



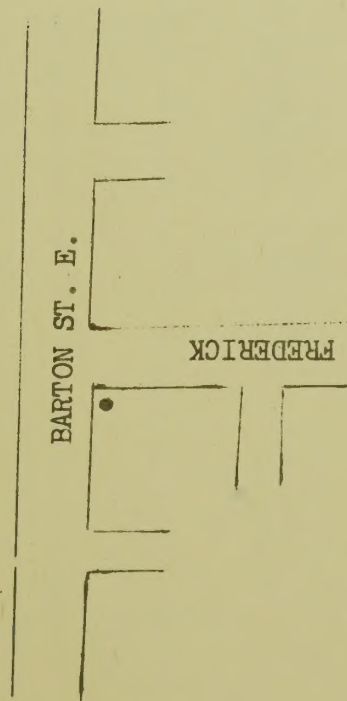
- N
- Location of noise measurement
- Map not drawn to scale

Location Description:

This site is located at the interface of industrial and residential areas in the heavy industrial belt of Hamilton.

The dominant source of noise is from the industrial plants and the heavy industrial traffic flow on Beach Road.

LOCATION 29 - Barton St. E. and Frederick



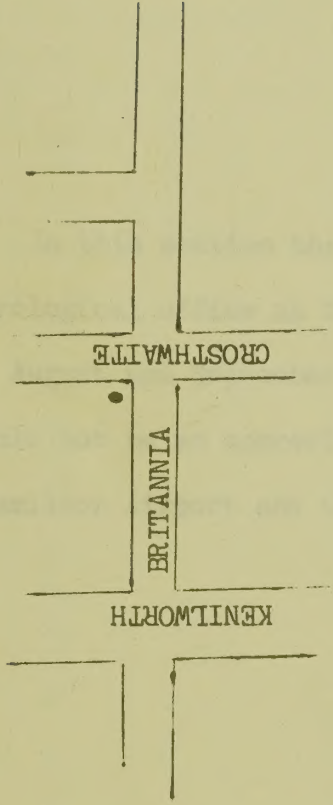
- Location of noise measurement
- Map not drawn to scale

Location Description:

This location is situated at the interface of commercial and residential areas. The location faces the Greater Hamilton Shopping Centre.

The noise is mainly due to the heavy traffic flow on Barton St. E.

LOCATION 30 - Crosthwaite and Britannia



- Location of noise measurement
- Map not drawn to scale

Location Description:

APPENDIX B

In this section the weather conditions as recorded by the Meteorological office at the Hamilton Airport over the months of July, August and September of '72 are given. It was felt that there would not be an appreciable difference in weather conditions at the Hamilton Airport and the City.

ATMOSPHERIC ENVIRONMENT SERVICE
DEPARTMENT OF THE ENVIRONMENT - CANADA
MONTHLY METEOROLOGICAL SUMMARY

68.

FOR THE MONTH OF July 1972 AT Hamilton Airport, Ontario.

LAT: 43° 10' LONG: 79° 56'

ELEVATION: 783 FEET.

STANDARD TIME USED: Eastern

DATE	TEMPERATURE (°F)			DEGREE DAYS BELOW 65°F	Vapour Pressure (millibars)			WIND (M.P.H.)			DURATION OF BRIGHT SUNSHINE (HOURS)	GROWING DEGREE DAYS ABOVE 42°	
	MAXIMUM	MINIMUM	MEAN FROM MAX AND MIN			7am	1pm	7pm	AVERAGE SPEED	PREVAILING DIRECTION			MAXIMUM SPEED AND DIRECTION
1	82	57	70			15.9	20.3	16.4	9.4	W,SW	W17	10.9	28
2	83	61	72			17.7	19.6	19.6	9.0	SW	SW15	6.7	30
3	63	53	58	7		14.2	14.2	15.3	8.4	NE	NE17	1.7	16
4	67	47	57	8		9.8	11.0	10.6	6.5	NW	NW10	9.8	15
5	63	52	58	7		9.4	8.4	11.8	7.0	NE	NE13	1.4	16
6	71	45	58	7		11.4	11.0	12.3	3.8	SW	W,SW,6	14.1	16
7	72	48	60	5		11.4	13.2	11.8	6.1	S	S12	10.2	18
8	73	55	64	1		15.9	15.9	14.8	5.3	S	W,SW,9	6.6	22
9	76	57	67			15.9	18.3	18.3	9.3	S	S,SW,15	4.6	25
10	79	62	71			19.0	20.3	20.3	12.9	SW	W19	3.5	29
11	84	62	73			19.0	25.0	25.9	4.3	S	S11	6.5	31
12	87	66	77			23.4	25.0	24.2	9.3	SW	S17	10.0	35
13	81	66	74			21.8	23.4	21.1	10.5	SW	W22	4.9	32
14	82	67	75			22.6	24.2	24.2	12.5	SW	W19	3.5	33
15	81	66	74			22.6	25.9	22.6	15.8	SW	SW24	1.6	32
16	79	66	73			21.8	22.6	22.6	3.5	W	W8	6.5	31
17	82	60	71			19.6	20.3	21.1	4.6	S	S10	11.7	29
18	86	67	77			24.2	25.9	26.8	9.6	SW	SW15	3.7	35
19	83	68	76			23.4	25.9	26.8	4.0	W	W8	2.3	34
20	90	68	79			24.2	27.7	28.7	7.7	SW	W15	9.7	37
21	88	72	80			26.8	25.9	24.2	9.7	NW	W14	12.2	38
22	90	68	79			21.8	29.6	27.7	9.5	SW	SW18	12.1	37
23	88	69	79			25.9	26.8	25.0	11.1	W	W27	9.0	37
24	83	63	73			20.3	21.1	22.6	10.8	W	W18	12.9	31
25	72	58	65			19.0	13.7	14.2	11.3	NW	NW20	13.0	23
26	69	53	61	4		14.2	12.7	12.7	8.9	W	NW14	7.2	19
27	73	56	65			13.2	12.7	14.2	4.4	NE	NE12	9.7	23
28	74	53	64	1		11.8	11.8	13.7	5.0	NE	N9	12.8	22
29	77	56	67			13.7	13.2	17.0	3.0	N	NE6	10.8	25
30	80	56	68			15.3	13.7	14.8	3.6	SE	S9	13.2	26
31	80	59	70			17.0	17.7	19.0	6.5	SW	SW14	12.0	28
MEAN	78.6	59.9	69.5	Total 40		18.1	19.3	19.5	7.9	Prevailing SW	Maximum W27	Total 264.8	Total 852
NORMAL	79.7	58.2	69.0	20								231.2	

DATE	RAINFALL	SNOWFALL	(2)	(3)	
			TOTAL PRECIP	DEPTH OF SNOW ON GROUND	
1.	Tr		Tr		1. Brief light shower in night. Thick fog early morning, then sunny.
2.	.03		.03		2. Sunny with cloudy intervals. Showers began near midnight.
3.	.27		.27		3. Rain in morning, tapered off midday.
4.					4. Partly cloudy.
5.					5. Mostly cloudy. Cool.
6.					6. Sunny.
7.					7. Sunny.
8.					8. Mostly cloudy, becoming mostly sunny by late afternoon
9.					9. Few light showers in afternoon and evening.
10.					10. Partly cloudy.
11.					11. Mostly sunny.
12.	Tr		Tr		12. Sunny. Brief thundershower in evening.
13.					13. Thundershowers in afternoon.
14.					14. Mostly cloudy.
15.					15. Shower around dawn, showers and thundershower late afternoon and early evening.
16.	.04		.04		16. Thick fog early morning, partly cloudy day.
17.	.57		.57		17. Mostly sunny.
18.					18. Mostly sunny, then thundershower in evening.
19.	.99		.99		19. Mostly cloudy, occasional light showers.
20.					20. Very warm and humid, hazy. Mostly sunny.
21.					21. Mostly sunny. Warm and humid.
22.	.09		.09		22. Sunny.
23.	.02		.02		23. Variable cloudiness. Thundershower in afternoon.
24.					24. Sunny.
25.					25. Sunny with cloudy intervals.
26.					26. Cloudy with sunny intervals.
27.	.09		.09		27. Shower during night, then partly cloudy day.
28.					28. Sunny with cloudy intervals.
29.					29. Sunny.
30.					30. Sunny.
31.					31. Sunny with some afternoon cloudiness.
1.					
2.					
3.					
4.					
5.					
6.					
7.	.05		.05		
8.					
9.					
10.					
11.					
TOTAL	2.15		2.15		
NORMAL	2.83		2.83		
DAYS WITH TOTAL PRECIPITATION					DAYS WITH SNOWFALL
0.01" OR MORE	0.04" OR MORE	0.25" OR MORE	0.50" OR MORE	1.00" OR MORE	0.1" OR MORE
9	7	3	2	0	0.4" OR MORE
					2.5" OR MORE
					5.0" OR MORE
					10.0" OR MORE
					NO.
					NORMAL
					DATES
					5
					-
					12.13,15,18,23

Highest Wind Gust: 57 mph on July 23rd at 2.40 pm E.S.T.

Greatest Rate of Rainfall: In 10 minutes 0.17" on 15th In 60 minutes 0.56" on 15th

TR = Trace = negligible amount of rain or snow. Precipitation data are based on 24-hour period beginning 0100 E.S.T.

Total precipitation is computed by adding rainfall in inches to water equivalent of the snowfall in inches.

Measurement taken at 7 am E.S.T.

ATMOSPHERIC ENVIRONMENT SERVICE
DEPARTMENT OF THE ENVIRONMENT - CANADA
MONTHLY METEOROLOGICAL SUMMARY

70.

FOR THE MONTH OF August 1972 AT Hamilton Airport, Ontario.

LAT: 43.10 LONG: 79.56 ELEVATION: 783 FEET. STANDARD TIME USED: Eastern.

DATE	TEMPERATURE (°F)			DEGREE DAYS BELOW 65°F	Vapour Pressure - mb				WIND (M.P.H.)			DURATION OF BRIGHT SUNSHINE (HOURS) **	GROWING DEGREE DAYS ABOVE 42°
	MAXIMUM	MINIMUM	MEAN FROM MAX AND MIN			7am	1pm	7pm	AVERAGE SPEED	PREVAILING DIRECTION	MAXIMUM SPEED AND DIRECTION (one hour)		
1	80	64	72			19.6	21.1	21.8	5.6	SW	N, SW, 14	4.3	30
2	73	61	67			17.7	21.3	22.6	5.9	SW	SW13	1.6	25
3	76	61	69			21.1	21.8	17.7	10.1	W	NW14	0	27
4	66	51	59	6		9.8	8.7	11.8	11.8	NE	NE24	1.7	17
5	72	47	60	5		11.8	12.7	11.4	5.0	SW	SW10	13.5	18
6	70	49	60	5		12.7	15.9	17.0	5.1	S	E8	0.4	18
7	73	59	66			17.7	21.1	19.0	6.3	E, NE	W, NW, 12	2.0	24
8	66	57	62	3		14.8	15.9	16.4	8.2	W	SW13	1.7	20
9	63	52	58	7		15.3	11.8	11.8	13.1	NW	W24	6.5	16
10	69	47	58	7		11.4	11.0	11.8	9.2	W	NW13	12.2	16
11	70	47	59	6		11.4	13.2	17.0	8.5	SW	S16	5.5	17
12	77	61	69			18.3	19.6	17.7	8.1	W	W, SW, 12	6.5	27
13	81	57	69			15.9	19.0	21.8	6.8	W	NW13	10.0	27
14	82	58	70			19.6	22.6	15.9	12.5	NE, SW	NE23	6.2	28
15	69	54	62	3		13.7	9.8	11.0	10.8	NE	E18	10.9	20
16	70	51	61	4		13.2	15.3	17.7	7.2	NE	S11	2.5	19
17	71	59	65			17.7	19.0	18.3	5.4	NE	NE9	0.1	23
18	80	62	71			21.8	19.0	17.0	10.2	NW	NW19	12.4	29
19	81	57	69			15.3	17.7	17.7	2.2	N, NE	NE8	12.9	27
20	78	59	69			15.3	15.3	16.4	6.6	NE	NE10	12.9	27
21	82	57	70			16.4	18.3	17.7	9.3	SW	SW7	10.8	28
22	82	62	72			20.3	22.6	21.8	10.1	SW	SW17	5.2	30
23	81	69	75			22.6	25.0	25.9	7.2	SW	SW12	0.6	33
24	85	68	77			22.6	23.4	22.6	6.8	SW	SW14	9.9	35
25	79	67	73			20.3	18.3	19.0	8.0	W	W14	11.5	31
26	77	62	70			18.3	23.4	22.6	8.8	NE	NE13	7.2	28
27	77	67	72			23.4	20.3	20.3	13.1	SW	SW22	2.6	30
28	79	63	71			18.3	20.3	20.3	12.3	W	W17	11.7	29
29	81	57	69			14.2	15.3	16.4	5.8	NW	N, NW, 10	10.3	27
30	79	53	66			13.7	12.7	16.4	3.8	SW, NW	S10	10.8	24
31	82	55	69			16.4	15.3	17.7	5.5	S	SW13	11.4	27
MEAN	75.8	57.8	66.8	Total 46		16.8	17.7	17.8	8.1	Prevailing SW	Maximum NE, W24	Total 215.8	Total 777
NORMAL	78.8	56.3	67.6	58								262.6	

PRECIPITATION (INCHES) (1)					DAILY WEATHER SUMMARY FOR August 1972 AT Hamilton Airport									
DATE	RAINFALL	SNOWFALL	TOTAL PRECIP (2)	DEPTH OF SNOW ON GROUND (3)										
1.	.44		.44		1.	Thunderstorms	afternoon	and	early	evening.				
2.	.67		.67		2.	Thundershowers	overnight,	showers	tapering	off	in			
3.	.15		.15		3.	Mostly	cloudy.	Occasional	showers	in	afternoon.			
4.					4.	Sunny.	Very	cool.						
5.					5.	Sunny.	Cool.							
6.	.04		.04		6.	Cloudy.	Light	rain	late	afternoon	and	evening.		
7.	3.57		3.57		7.	Thunderstorms,	heavy	rainfalls.						
8.	.07		.07		8.	Mostly	cloudy.	Showers	began	late	afternoon.			
9.	.11		.11		9.	Showers	ended	during	night.	Partly	cloudy,	cool	day.	
10.					10.	Sunny	with	cloudy	intervals.	Cool.				
11.	.06		.06		11.	Increasing	cloudiness.	Light	showers	in	evening.			
12.					12.	Cloudy,	clearing	in	evening.					
13.					13.	Mostly	sunny.							
14.	.35		.35		14.	Occasional	showers	and	thundershowers.					
15.					15.	Sunny.	Cool.							
16.	.14		.14		16.	Rain	late	afternoon	and	evening.				
17.					17.	Thick	fog	in	morning.	Mostly	cloudy	day.		
18.	.03		.03		18.	Brief	shower	before	dawn,	thick	fog	in	morning,	
19.						becoming	mostly	sunny	day.					
20.					19.	Sunny.								
21.					20.	Sunny.								
22.					21.	Dense	fog	early	forenoon,	becoming	mostly	sunny.		
23.	Tr		Tr		22.	Considerable	sunshine.	Hazy	and	warm.				
24.	.04		.04		23.	Mostly	cloudy,	warm,	humid,	with	few	light	showers.	
25.					24.	Some	light	rain	during	night.	Mostly	sunny	day.	
26.	.15		.15			Thunderstorms	in	vicinity	during	early	evening.			
27.	.06		.06		25.	Mostly	sunny.							
28.	.04		.04		26.	Partly	cloudy.	Thundershowers	in	evening.				
29.					27.	Partly	cloudy.	Shower	in	evening.				
30.					28.	Cloudy,	clearing	in	afternoon.	Brief	shower	late		
31.						evening.								
					29.	Sunny.								
					30.	Sunny.								
					31.	Sunny.								
					* * * * *									
					Highest Wind Gust: 35 mph on Aug. 27th, 1.10 pm E.S.T.									
					* * * * *									
					Greatest Rate In 10 minutes In 60 minutes									
					of Rainfall: 0.42" on 7th 1.41" on 7th									
TOTAL	5.92		5.92											
NORMAL	2.80		2.80											
DAYS WITH TOTAL PRECIPITATION					DAYS WITH SNOWFALL					THUNDERSTORMS				
0.01" OR MORE	0.04" OR MORE	0.25" OR MORE	0.50" OR MORE	1.00" OR MORE	0.1" OR MORE	0.4" OR MORE	2.5" OR MORE	5.0" OR MORE	10.0" OR MORE	NO.	NORMAL	DATES		
15	14	4	2	1						6		1,2,7,14,24,26.		

(1) TR = Trace = negligible amount of rain or snow. Precipitation data are based on 24-hour period beginning 1 am E.S.T.

(2) Total precipitation is computed by adding rainfall in inches to water equivalent of the snowfall in inches.

(3) Measurement taken at 7 am E.S.T.

ATMOSPHERIC ENVIRONMENT SERVICE
DEPARTMENT OF THE ENVIRONMENT - CANADA
MONTHLY METEOROLOGICAL SUMMARY

72.

FOR THE MONTH OF September 1972 AT Hamilton Airport, Ontario.

LAT: 43° 10' LONG: 79° 56'

ELEVATION: 783 FEET.

STANDARD TIME USED: Eastern

DATE	TEMPERATURE (°F)			DEGREE DAYS BELOW 65°F	Vapour Pressure -mb			WIND (M.P.H.)			*DURATION OF BRIGHT SUNSHINE (HOURS)	GROWING DEGREE DAYS ABOVE 42°	
	MAXIMUM	MINIMUM	MEAN FROM MAX AND MIN			7am	1pm	7pm	AVERAGE SPEED	PREVAILING DIRECTION			MAXIMUM SPEED AND DIRECTION (one hour)
1	83	61	72			18.3	20.3	19.6	8.5	S	S15	8.7	30
2	76	61	69			17.0	19.0	14.8	9.1	NE	NE15	3.4	27
3	68	55	62	3		14.2	11.8	12.7	9.4	NE	NE15	8.3	20
4	70	47	59	6		11.0	9.4	10.2	7.3	NW	W12	8.7	17
5	72	45	59	6		10.2	11.4	13.2	8.7	W	W15	9.0	17
6	75	54	65	0		14.8	18.3	18.3	4.9	SW	SW8	3.8	23
7	77	56	67	0		17.0	16.4	18.3	11.3	SW	SW20	6.7	25
8	73	60	67	0		21.1	21.1	21.4	5.0	N	N10	1.4	25
9	69	49	59	6		11.4	9.4	9.1	11.4	N	N18	10.5	17
10	69	45	57	8		10.2	10.6	11.0	4.4	S	N8	9.9	15
11	75	53	64	1		13.2	14.8	18.2	8.6	SW	W14	4.4	22
12	69	60	65	0		17.0	18.3	18.3	3.3	W	S,SW,8	0.4	23
13	76	62	69	0		19.0	22.6	21.1	8.5	W,SW	W19	0.0	27
14	70	51	61	4		17.7	12.7	11.8	8.3	NW	NW18	6.1	19
15	69	42	56	9		9.4	13.7	12.7	12.2	SW	SW23	9.6	14
16	75	55	65	0		13.2	17.7	17.7	12.8	SW	SW24	7.3	23
17	83	64	74	0		21.8	20.3	14.2	17.3	SW,W	SW30	8.7	32
18	76	60	68	0		14.2	19.6	19.0	7.0	NE	S13	3.6	26
19	66	52	59	6		15.9	12.7	11.8	10.0	NE	NE17	4.7	17
20	65	48	57	8		10.6	11.0	13.2	11.1	NE	E18	9.6	15
21	73	49	61	4		14.2	17.0	15.9	11.8	SW	SW19	8.4	19
22	61	42	52	13		7.8	7.2	7.8	8.3	NW	NW20	9.6	10
23	61	40	51	14		8.4	10.6	12.7	6.0	NE,E	E14	4.0	9
24	70	54	62	3		15.9	19.6	20.3	6.5	SW	SW14	1.2	20
25	74	64	69	0		20.3	21.8	21.1	10.9	SW	SW19	0.6	27
26	72	61	67	0		19.6	21.8	22.6	14.6	SW	SW22	0.3	25
27	61	46	54	11		9.8	10.6	9.1	10.3	N	NW15	2.9	12
28	63	44	54	11		9.1	11.4	12.7	11.0	E	E17	8.8	12
29	70	45	58	7		18.3	17.7	14.2	15.0	S	S22	0.3	16
30	54	38	46	19		8.4	8.1	6.4	13.9	NW	NW23	5.6	4
MEAN	70.5	52.1	61.3	Total 139		14.3	15.2	15.0	9.6	Prevailing SW	Maximum SW30	Total 166.7	Total 588
NORMAL	71.0	50.4	60.7	157								173.5	

PRECIPITATION (INCHES) (1)					DAILY WEATHER SUMMARY FOR September AT Hamilton Arpt.									
DATE	RAINFALL	SNOWFALL	TOTAL PRECIP (2)	DEPTH OF SNOW ON GROUND (3)	1972									
1.					1. Sunny. warm, hazy.									
2.	.01		.01		2. Sunny, hazy, clouding over in afternoon. Showers began late evening.									
3.	.04		.04		3. Few showers after midnight. Partly cloudy day.									
4.					4. Sunny.									
5.					5. Sunny.									
6.	Tr		Tr		6. Variable cloudiness. Brief light shower in forenoon.									
7.	.01		.01		7. Few showers after midnight. Some fog around dawn.									
8.	.38		.38		Sunny morning, increasing cloudiness in afternoon.									
9.					8. Rain and fog in morning. Variable cloudiness in afternoon. Brief shower in evening.									
10.					9. Sunny.									
11.					10. Sunny.									
12.					11. Sunny, then increasing cloudiness in afternoon.									
13.	.07		.07		12. Overcast.									
14.					13. Rain during morning. Sunny intervals afternoon.									
15.					14. Cloudy, becoming mostly sunny.									
16.					15. Sunny.									
17.					16. Sunny.									
18.	.08		.08		17. Sunny.									
19.	Tr		Tr		18. Variable cloudiness. Occasional showers.									
20.					19. Mostly cloudy. Occasional light rain and drizzle in forenoon.									
21.					20. Sunny.									
22.					21. Sunny.									
23.	.16		.16		22. Sunny.									
24.	.07		.07		23. Clouding over, rain beginning in evening.									
25.	Tr		Tr		24. Rain during night. Light drizzle and rain around dawn. Mostly cloudy day.									
26.	.23		.23		25. Cloudy. Few light showers.									
27.					26. Cloudy. Intermittent rain.									
28.					27. Cloudy, partial clearing late in day.									
29.	.13		.13		28. Sunny.									
30.	.57		.57		29. Cloudy. Intermittent rain.									
					30. Rain tapered off in morning. Sunny in afternoon.									
					* * * * *									
					Highest Wind Gust: 49 mph on Sept. 17th, 1.55 a.m. E.S.T.									
					* * * * *									
					Greatest Rate In 10 minutes In 60 minutes									
					of Rainfall: 0.07 on 18th. 0.15" on 29th.									
TOTAL					1.75					1.75				
NORMAL					2.89					2.89				
DAYS WITH TOTAL PRECIPITATION					DAYS WITH SNOWFALL					THUNDERSTORMS				
0.01" OR MORE	0.04" OR MORE	0.25" OR MORE	0.50" OR MORE	1.00" OR MORE	0.1" OR MORE	0.4" OR MORE	2.5" OR MORE	5.0" OR MORE	10.0" OR MORE	NO.	NORMAL	DATES		
11	9	2	1	0						Nil	-	-		

(1) TR = Trace = negligible amount of rain or snow. Precipitation data are based on 24-hour period beginning 1 a.m. E.S.T.

(2) Total precipitation is computed by adding rainfall in inches to water equivalent of the snowfall in inches.

(3) Measurement taken at 7 a.m. E.S.T.



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